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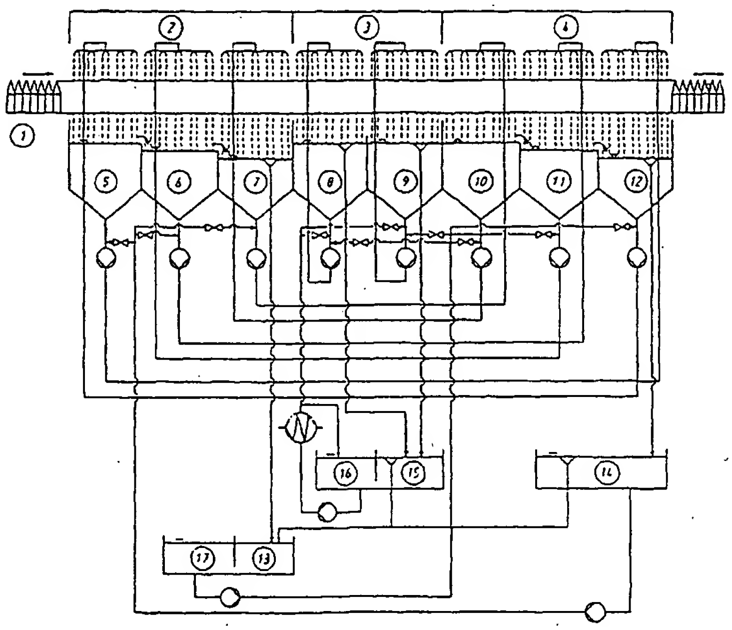
(54) **PROCEDURE D'EXPLOITATION D'UNE INSTALLATION DE PASTEURISATION**

(54) **OPERATING PROCEDURE FOR A PASTEURIZING FACILITY**





(57) A method and an apparatus therefor for the pasteurization of products in containers in a continuous container flow by stationary, sequential sections for heating, pasteurizing, and cooling by means of overflowing liquid, whereby the sections are graduated with respect to one another in terms of their liquid temperature, and for purposes of efficient heat exchange are organized in pairs, so that the liquid is transported by overflow from a heating zone to a cooling zone and the liquid overflowing from this cooling zone is transported to the heating zone, and to set the desired temperature of the overflowing liquid, warmer or cooler liquid is added to the liquid being transported, characterized by the fact that the excess liquid in the heating section added by the temperature regulation process to the zones in the method overflows in a cascade fashion from zone to zone of increasing overflow temperature, and in the cooling section overflows in cascade fashion from zone to zone of decreasing overflow temperature, and from the hottest zone in the heating section overflows into a warm liquid reservoir, and from the coldest zone in the cooling section into a cold liquid reservoir, and the excess fluid added by the regulation process to the pasteurizing section overflows from the zones into a hot liquid reservoir.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# OPERATING PROCEDURE FOR A PASTEURIZING FACILITY

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention:

This invention relates to a method for the operation of a pasteurizing plant or facility for pasteurizing products in containers, as well as to an apparatus that is suitable for the performance of the method.

### 2. Background Information:

In the beverage industry, in particular when products being bottled are easily perishable, it is common practice to pasteurize the products. In pasteurizing plants of the known art, the containers that contain the products are transported in a practically uniform movement from the entry of the plant to the exit from the plant. As they move through the plant, they are heated until they have achieved the required degree of pasteurization and are then cooled, whereupon the pasteurizing process is completed. A pasteurizing tunnel provided for this purpose consequently has a heating section, a superheating and pasteurizing section, and a final cooling section. The individual sections can have additional sub-zones. The gradual heating and cooling that such an arrangement provides is preferred, in particular for the glass bottles used in the beverage industry, to prevent any destruction of the glass bottles caused by abrupt temperature changes. The transmission of heat to the product in the containers normally occurs by spraying these containers with water as they are advanced on a conveyor belt which allows the liquid to be sprayed from underneath. Underneath the conveyor belt are catch basins for the sprayed liquid from which the pumps for the spraying are fed. Heat can be exchanged by means of the spray liquid zone-wise between the zones to be heated and the zones to be cooled.

In at least one possible embodiment of the present invention, the containers to be pasteurized and the pasteurized containers preferably are bottles.

To achieve an optimal graduation of the temperatures in the individual sections, the sections are subdivided into individual zones. Generally, the heating section has three to

four individual zones, the pasteurizing section has two or three zones, and there can be an additional superheating zone upstream of the pasteurizing zone. The following cooling section in turn has three to four individual zones, in which the containers are cooled by reducing the temperature of the spraying liquid in steps until the containers reach the desired output temperature.

To guarantee that the product in the containers achieves the specified degree of pasteurization, the individual spraying temperatures set must be adapted to the following factors, for example: the product, the length of the zones, and the speed of the conveyor belt.

Because such a pasteurization system is installed as part of a more comprehensive bottling plant and represents only a portion of this bottling plant, disruptions in the continuous feed of the containers, i.e., an interruption in the flow of containers, or disruptions in the removal of the containers, i.e., a production stoppage, can occur more or less frequently. The result of a production stoppage is that the taste of the products that are currently being held at the pasteurization temperature can be adversely affected by over-pasteurization.

If there is an interruption in the container flow or if the plant runs empty, the thermal equilibrium between the products being heated and the products being cooled is disrupted so that initially the products leave the plant at an excessive temperature, later the pasteurized products are no longer cooled quickly enough, and finally the products that enter the pasteurizing section are no longer at the required pasteurization temperature.

In other words, in known pasteurizing systems, if there is an interruption in the container flow or if the pasteurization or bottling plant runs empty, the thermal equilibrium between the products being heated and the products being cooled may be disrupted. As a result of such disruption, containers that enter the pasteurizing section may not be at the required pasteurization temperature. These containers may not be cooled quickly enough after pasteurization and therefore may leave the plant at an excessive temperature.

The consequences of the type of production disruption described above can be prevented by the controlled addition or removal of thermal energy. Generally, either heat is added to the process indirectly by means of heat exchangers or hot water is added directly from a central heat source and returned at a colder temperature. The removal of heat from the process is realized, as in the known art, by the addition of cold liquid, which is then removed at a higher temperature.

## OBJECT OF THE INVENTION

One object of the present invention may be to propose a method for the operation of such a pasteurizing plant in which the response to disruptions in the container flow can be managed in an essentially optimum fashion with an essentially minimized utilization of the resources water and heat.

## SUMMARY OF THE INVENTION

One characteristic of the process may be that each addition of heat required for regulation of the process may be followed after some delay by the removal of heat (and vice versa) on the same order of magnitude. In this regard, the teachings concerning the storage of the heat are described in some publications.

One disadvantage of the methods described in some publications, however, is that as a result of the collection of the liquid overflowing from the plant in a conduit or in a plurality of reservoirs, a mixing of the temperatures takes place so that the resulting temperature of the fluid in the reservoir cannot be used either for controlled cooling or for controlled heating. An additional disadvantage is that although heat is stored on a low temperature level, the liquid in question cannot be used for cooling, i.e., there is no conservation of water.

At least one possible embodiment of the present invention teaches that to eliminate these disadvantages, the excess liquid in the heating section added by the regulation process to the zones in the method overflows in a cascade fashion from zone to zone of increasing overflow temperature; in the cooling section, overflows in cascade fashion from zone to zone of decreasing overflow temperature; from the last zone, i.e, the hottest zone in the heating section, overflows into an essentially warm liquid reservoir or tank 13; and from the coldest zone, position, or tank 10 in the cooling section,

overflows into an essentially cold liquid reservoir or tank 14. Also, to eliminate the disadvantages of the known art, at least one possible embodiment of the present invention preferably teaches that the excess fluid added by the regulation process to the pasteurizing section overflows from the zones into an essentially hot liquid reservoir 15.

In an independent realization of the invention, the liquid contained in the cold liquid reservoir 14 can be forcibly transported and used in a controlled fashion to cool at least the zones or tanks in the cooling section and in the pasteurizing section; the liquid contained in the warm liquid reservoir 13 can be forcibly transported and used in a controlled fashion to heat at least the zones or tanks in the heating section or to cool the zones or tanks in the pasteurizing section; and the liquid in the hot liquid reservoir, after the addition of thermal energy, can be used in a controlled fashion to heat at least the zones or tanks in the pasteurizing section.

As a result of the use of at least one possible embodiment of the present invention, the cold water in the initial portion of the heating section may be essentially gradually heated to the respective higher operating temperatures of the subsequent zones, and the water injected into the cooling section is in turn cooled down essentially gradually, as a function of the individual zones, which may lead to a particularly efficient use of energy. Additionally, when there is a disruption in the feed of the containers to be pasteurized, the quantity of water currently in the containers can be used for an essentially rapid cooling of the critical zones, as well as for an essentially rapid heating of these zones and the additional zones, as a result of which the consumption of fresh water can be reduced significantly.

In other words, in at least one possible embodiment of the present invention, water or other liquid, even in the event of a stoppage, interruption, or emptying of the bottling plant or pasteurization system, preferably is recycled from the cooling section to the heating section, for example, and vice versa. Also, in at least one possible embodiment of the present invention, water or other liquid, even in the event of a stoppage, interruption, or emptying of the bottling plant or

pasteurization system, is maintained at an essentially constant temperature by means of tanks or reservoirs that may be centrally located in the pasteurization system.

The above-discussed embodiments of the present invention will be described further hereinbelow with reference to the accompanying figures. When the word "invention" is used in this specification, the word "invention" includes "inventions", that is, the plural of "invention". By stating "invention", Applicants do not in any way admit that the present application does not include more than one patentably and non-obviously distinct invention, and maintain that this application may include more than one patentably and non-obviously distinct invention. Applicants hereby assert that the disclosure of this application may include more than one invention, and, in the event that there is more than one invention, that these inventions may be patentable and non-obvious one with respect to the other.

One aspect of the invention resides broadly in a method for the pasteurization of products in containers in a continuous container flow (1) by stationary, sequential sections for heating (2), pasteurizing (3) and cooling (4) by means of overflowing liquid, whereby the sections are graduated with respect to one another in terms of their liquid temperature, and for purposes of efficient heat exchange are organized in pairs, so that the liquid is transported by overflow from a heating zone to a cooling zone and the liquid overflowing from this cooling zone is transported to the heating zone, and to set the desired temperature of the overflowing liquid, warmer or cooler liquid is added to the liquid being transported, characterized by the fact that the excess liquid in the heating section (2) added by the temperature regulation process to the zones in the method overflows in a cascade fashion from zone to zone of increasing overflow temperature, and in the cooling section (4) overflows in cascade fashion from zone to zone of decreasing overflow temperature, and from the last zone, i.e the hottest zone (7) in the heating section overflows into a warm liquid reservoir (13), and from the coldest zone (10) in the cooling section into a cold liquid reservoir (14), and the excess fluid added by the regulation process to the pasteurizing

section overflows from the zones into a hot liquid reservoir (15).

BRIEF DESCRIPTION OF THE DRAWING

The invention is explained in greater detail below with reference to at least one exemplary embodiment, which is illustrated in the accompanying drawings as follows:

Figure 1 is a diagram of a pasteurizing plant;

Figure 2 is an enlarged reproduction of Figure 1 with additional information;

Figures 2A, 2B, 2C, 2D, 2E, and 2F are enlarged views of sections of Figure 2;

Figure 2G is an enlarged view of the control system and microprocessor shown in Figure 2;

Figures 3-18 are flow charts for the operation of the pasteurizing system shown in Figures 2 and 2A-2G;

Figure 19 is essentially identical to Figure 2 except for the substitution of a manual control arrangement for the microprocessor shown in Figure 2; and

Figure 19A is an enlarged view of the manual control arrangement shown in Figure 19.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in Figures 1, 2, 2A, and 19, the pasteurizing plant consists of a heating section 2 located in the initial portion, determined on the basis of the direction of travel of the respective container or respective bottle or flow of containers or bottles 1, which heating section in turn consists of a plurality of individual zones or tanks 5-7, whereby the heating phase is correspondingly essentially gentle and gradual. As shown in Figures 1, 2, 2B, and 19, following this heating section 2 is a superheating zone 8, which is followed in turn by the actual pasteurizing zone or pasteurizing zone or tank 9. Then, as shown in Figures 1, 2, 2C, and 19, the cooling section 4 begins which, as with the other sections, can consist of a larger number of individual zones or tanks 10-12.

The operating program of such a pasteurizing plant is initially designed to conduct the pasteurizing operation under essentially optimum conditions. For example, the invention teaches that the first heating zone 5 has a spray temperature of approximately 18 degrees Celsius, for example. The initial

temperature of the pasteurized products is accordingly set at a spray temperature of approximately 17 degrees Celsius. The second heating zone 6 has a spray temperature of slightly greater than 24 degrees Celsius, whereby the cooling zone that communicates with it can be at a temperature of somewhat less than 23 degrees Celsius. Using the example of these two zones 5,6, it is apparent that the water from the cooling zones 4 is conducted respectively to the zone 5 in the heating section 2, the desired heating temperature of which comes closest to the desired cooling temperature. To equalize the respective temperature difference, water from the first tank 13, shown in Figures 1, 2, 2D, and 19, is essentially advantageously added in small amounts to the water from the cooling section 4, which additional higher-temperature water or other liquid originates from the final station 7 of the heating section 2. Following this heating section 2 is the superheating zone 8, the temperature of which is in turn higher than the temperature of the final heating zone 7. The superheating zone 8 is fed from a second tank 15, shown in Figures 1, 2, 2E, and 19, with water or other liquid at a higher temperature than the water in the first tank 13. Associated with the tank 15 is a third tank 16, as shown in Figures 1, 2, 2E, and 19, to which the excess water or other liquid from the tank 15 is fed. This tank 16 is also maintained at a specified higher temperature than the water in the tank 13 by means of a heater device or heat exchanger 57, shown in Figures 1, 2, 2E, and 19. The water or other liquid in tank 16 is also used to feed the superheating and pasteurizing zones 8, 9, whereby the quantity of hot water or other liquid discharged is collected in the tank 15 and is mixed with the hot water of the tank 16.

In the event of a disruption in production, e.g., a disruption caused by a backup of containers in the bottling plant, a control device or system 18, which control system 18 is shown in Figures 1, 2, and 2G, essentially immediately actuates certain of the valves 58-67, which valves 58-67 are shown in Figure 2, so that, for example, the lower-temperature water from the tank 16 is fed to the superheating and/or pasteurizing zones 8, 9. Lower-temperature water can also be fed to the other sections 2, 4, for example, from an additional fourth tank 14, shown in Figures 1, 2, 2F, and 19.

In other words, in at least one possible embodiment of the present invention as shown in Figure 2, the tanks 5-12, before the pasteurization system is activated, are filled with liquid to a predetermined level regulated by liquid level sensors 21 (for tank 5), 23 (for tank 6), 25 (for tank 7), 27 (for tank 8), 29 (for tank 9), 31 (for tank 10), 33 (for tank 11), and 35 (for tank 12), which liquid level sensors 21, 23, 25, 27, 29, 31, 33, and 35 are shown in Figures 1, 2, 2A-2F, and 19. The liquid level sensors 21, 23, 25, 27, 29, 31, 33, and 35 may be located in, or generally at or about, one or more of the tanks 5-12 and are controlled by a control system 18, which control system 18 is preferably controlled by a microprocessor 19, shown in Figures 1, 2, and 2G.

The tanks 5-12, before the pasteurization system is activated, are filled with liquid having a predetermined spray temperature regulated by temperature sensors 20 (for tank 5), 22 (for tank 6), 24 (for tank 7), 26 (for tank 8), 28 (for tank 9), 30 (for tank 10), 32 (for tank 11), and 34 (for tank 12), which temperature sensors 20, 22, 24, 26, 28, 30, 32, and 34 are shown in Figures 1, 2, 2A-2F, and 19. The tanks 5-12 preferably have heaters to heat the liquid therein to a desired temperature. The spray temperature sensors 20, 22, 24, 26, 28, 30, 32, and 34 may be located in, or generally at or about, one or more of the tanks 5-12 and are controlled by a control system 18, which control system 18 is preferably controlled by a microprocessor 19.

In other words, there are three zones or sections 2-4 in the pasteurization system: the heating section 2, the pasteurization section 3, and the cooling section 4. In the sections 2-4 there are tanks 5-12, which provide liquid to be sprayed over the containers 36. Specifically, tanks 5-7 provide liquid for heating section 2; tanks 8-9 provide liquid for the pasteurizing section 3; and tanks 10-12 provide liquid for the cooling section 4. The tanks 5-12 vary among themselves in the temperature of their liquid contents as follows. In heating section 2, the liquid in tanks 5-7 increase in temperature from tank 5 to tank 7, so that tank 5 and tank 6 contain and spray lower-temperature liquid than does tank 7. In the pasteurizing section 3, tank 8 is the superheating tank, containing and spraying higher-temperature liquid than does the pasteurization tank 9. In the

cooling section 4, the liquid contained in and sprayed by tanks 10-12 decrease in temperature from tank 10 to tank 12, so that the temperature of the liquid in tank 10 is higher than the temperature in tank 11, and the temperature of the liquid in tank 11 is higher than the temperature in tank 12.

In another possible embodiment of the present invention, the superheating tank 8 may contain and spray lower-temperature liquid than does the pasteurization tank 9.

Alternatively, in the cooling section 4, the liquid contained in and sprayed by tanks 10-12 increases in temperature from tank 10 to tank 12, so that the temperature of the liquid in tank 10 is lower than the temperature in tank 11, and the temperature of the liquid in tank 11 is lower than the temperature in tank 12.

When containers 36, as shown in Figure 2, are put on a conveyor belt (not shown) or on some other similar apparatus to enter the pasteurization system or begin the pasteurization process, if there are no stoppages, backups, or disruptions in the system or process or in the movement of the containers 36, shown in Figures 1, 2, 2A, and 19, the containers 36 will be moved from the heating section 2, then to the pasteurizing section 3, and then to the cooling section 4. In other words, the containers 36 will be sprayed by liquid provided by the tanks 5-12 in the following order: zone 5, zone 6, zone 7, zone 8, zone 9, zone 10, zone 11, and zone 12. As shown in Figure 2, this movement of the containers 36 through the sections 2-4 of the pasteurization system will produce pasteurized products 37, shown in Figures 1, 2, 2C, and 19.

If there are no stoppages, backups, or disruptions in the system of process or in the movement of the containers 36, the containers 36 move or are moved through the sections 2-4 in a time period within the range of approximately 15 minutes to approximately 20 minutes. In another possible embodiment of the present invention, the containers 36 move or are moved through the sections 2-4 in a time period within the range of approximately 15 minutes to approximately 30 minutes. In yet another possible embodiment of the present invention, the containers 36 move or are moved through the sections 2-4 in a time period within the range of approximately 10 minutes to approximately 45 minutes.

In at least one possible embodiment of the present invention as shown in Figure 2, spray arrangements or sprayers 38-45 are associated with each of the tanks 5-12 as follows. Spray arrangement 38 is associated with tank 5. Spray arrangement 39 is associated with tank 6. Spray arrangement 40 is associated with tank 7. Spray arrangement 41 is associated with tank 8. Spray arrangement 42 is associated with tank 9. Spray arrangement 43 is associated with tank 10. Spray arrangement 44 is associated with tank 11. Spray arrangement 45 is associated with tank 12. Spray arrangements 38-45 may be located generally at, about, or above their respective tanks 5-12.

In the possible embodiment of the present invention shown in Figure 2, the spray arrangements 38-45 are supplied with liquid by the tanks 5-12, for example, as follows. Spray arrangement 38 is supplied with liquid by tank 12. Spray arrangement 39 is supplied with liquid by tank 11. Spray arrangement 40 is supplied with liquid by tank 10. Spray arrangement 41 is supplied with liquid by tank 8. Spray arrangement 42 is supplied with liquid by tank 9. Spray arrangement 43 is supplied with liquid by tank 7. Spray arrangement 44 is supplied with liquid by tank 6. Spray arrangement 45 is supplied with liquid by tank 5.

The tanks 7, 8, 9, and 12 supply the tanks 13, 14, and 15 with liquid as follows. Tank 7 supplies tank 13. Tank 8 and tank 9 supply tank 15. Tank 12 supplies tank 14.

Tanks 14, 15, and 16 are supplied with liquid as follows. Tank 13 supplies tank 14. Tank 13 also supplies tank 17 and vice versa. Tank 15 supplies tank 16 and vice versa.

Pumps 46-53, shown in Figure 2, pump liquid to the spray arrangements 38-45 as follows. Pump 46 pumps liquid to spray arrangement 45. Pump 47 pumps liquid to spray arrangement 44. Pump 48 pumps liquid to spray arrangement 43. Pump 49 pumps liquid to spray arrangement 41. Pump 50 pumps liquid to spray arrangement 42. Pump 51 pumps liquid to spray arrangement 40. Pump 52 pumps liquid to spray arrangement 39. Pump 53 pumps liquid to spray arrangement 38.

Pumps 54-56 pump liquid to tanks 9, 12, and 7 as follows. Pump 54 pumps liquid to tank 9. Pump 55 pumps liquid to tank 12. Pump 56 pumps liquid to tank 7.

Valves 58-67 partly regulate the flow of liquid to pumps 46-53 as follows. Valve 58 allows release of liquid into pump 46. Valve 59 allows release of liquid into pump 47. Valve 60 allows release of liquid into pump 48. Valve 61 allows release of liquid into pump 49. Valve 62 allows release of liquid into pump 49. Valve 63 allows release of liquid into pump 50. Valve 64 allows release of liquid into pump 50. Valve 65 allows release of liquid into pump 51. Valve 66 allows release of liquid into pump 52. Valve 67 allows release of liquid into pump 53.

A heat exchanger 57 regulates the temperature of the liquid passing to tank 16. The heat exchanger 57 is controlled by the control system 18.

Overflow of liquid occurs as follows. Liquid overflows from tank 5 into tank 6, which is lower than tank 5. Liquid overflows from tank 6 into tank 7, which is lower than tank 6. Liquid overflows from tank 7 into tank 13 via an overflow device 68, shown in Figure 2, which overflow device 68 is located generally on, in, at, or about tank 7. Liquid overflows from tank 8 into tank 15 via an overflow device 69, shown in Figure 2, which overflow device 69 is located generally on, in, at, or about tank 8. Liquid overflows from tank 9 into tank 15 via an overflow device 70, shown in Figure 2, which overflow device 70 is located generally on, in, at, or about tank 9. Liquid overflows from tank 10 into tank 11, which is lower than tank 10. Liquid overflows from tank 11 into tank 12, which is lower than tank 11. Liquid flows from tank 12 into tank 14 via an overflow device 71, shown in Figure 2, which overflow device 71 is located generally on, in, at, or about tank 12. Liquid overflows from tank 15 to tank 13 via an overflow device 72, shown in Figure 2, which overflow device 72 is located generally on, in, at, or about tank 15. Liquid overflows from tank 14 to tank 13 via an overflow device 73, shown in Figure 2, which overflow device 73 is located generally on, in, at, or about tank 14.

If there is stoppage, breakage, or another interruption in the continuous container flow 1, tanks 13-17 preferably supply liquid to pumps 46-56, valves 58-67, and spray arrangements 38-45 through at least one of the following pathways. Tank 17 supplies liquid to pump 55; pump 55 pumps liquid to valve 67; valve 67

releases liquid into pump 53; and pump 53 supplies liquid to spray arrangement 38. Tank 17 supplies liquid to pump 55; pump 55 pumps liquid to valve 66; valve 66 releases liquid into pump 52; and pump 52 supplies liquid to spray arrangement 39. Tank 17 supplies liquid to pump 55; pump 55 pumps liquid to valve 65; valve 65 releases liquid into pump 51; and pump 51 supplies liquid to spray arrangement 40. Tank 17 supplies liquid to pump 55; pump 55 pumps liquid to valve 64; valve 64 releases liquid into pump 50; and pump 50 supplies liquid to spray arrangement 42. Tank 16 supplies liquid to pump 54; pump 54 pumps liquid to valve 63; valve 63 releases liquid into pump 50; and pump 50 supplies liquid to spray arrangement 42. Tank 17 supplies liquid to pump 55; pump 55 pumps liquid to valve 62; valve 62 releases liquid into pump 49; and pump 49 supplies liquid to spray arrangement 41. Tank 16 supplies liquid to pump 54; pump 54 pumps liquid to valve 61; valve 61 releases liquid into pump 49; and pump 49 supplies liquid to spray arrangement 41. Tank 14 supplies liquid to pump 56; pump 56 pumps liquid to valve 60; valve 60 releases liquid into pump 48; and pump 48 supplies liquid to spray arrangement 43. Tank 14 supplies liquid to pump 56; pump 56 pumps liquid to valve 59; valve 59 releases liquid into pump 47; and pump 47 supplies liquid to spray arrangement 44. Tank 14 supplies liquid to pump 56; pump 56 pumps liquid to valve 58; valve 58 releases liquid into pump 46; and pump 46 supplies liquid to spray arrangement 45.

The conveyor belt (not shown) or other apparatus for moving the containers 36 has position, proximity, or movement sensors 74-81 for detecting the presence of containers 36 as follows. Position sensor 74 is associated with tank 5 and spray arrangement 38. Position sensor 75 is associated with tank 6 and spray arrangement 39. Position sensor 76 is associated with tank 7 and spray arrangement 40. Position sensor 77 is associated with tank 8 and spray arrangement 41. Position sensor 78 is associated with tank 9 and spray arrangement 42. Position sensor 79 is associated with tank 10 and spray arrangement 43. Position sensor 80 is associated with tank 11 and spray arrangement 44. Position sensor 81 is associated with tank 12 and spray arrangement 45. Position sensors 74-81 may be located generally on, in, at, or about the conveyor belt or other apparatus for moving the

containers 36 and 37. Alternatively, position sensors 74-81 may be located generally on, at, or about the tanks 5-12.

The control system 18, as shown in Figures 2 and 2G, is connected to and controls pumps 46-56; valves 58-67; position sensors 74-81; liquid level sensors 21, 23, 25, 27, 29, 31, 33, and 35; temperature sensors 20, 22, 24, 26, 28, 30, 32, and 34; and heat exchanger 57. As shown in Figures 2 and 2G, the control system 18 is preferably operated by means of a microprocessor 19.

Figures 3-18 are flow charts illustrating possible operation of the pasteurization system. Figures 3-8 illustrate possible embodiments of the present invention in which there is an interruption or stoppage in the flow of containers or bottles. Figures 9-14 are flow charts illustrating startup of the pasteurization system in at least one possible embodiments of the present invention. For example, Figures 9-14 present possible decision trees for spraying the first flow of bottles or containers that passes through the pasteurization system after this system has been turned on or activated. Figures 15-18 illustrate emptying each of the heating zone 2, the pasteurization zone 3, and the cooling zone 4 of bottles until there are no bottles sensed by any of the position sensors 74-81. In other words, Figures 15-18 preferably illustrate at least one possible embodiment of the present invention in which the pasteurization system is shut down.

In Figure 3, if position sensor 74 senses bottles or containers, the operation of pump 53 is maintained. If position sensor 74 senses no bottles, pump 53 is turned off and a determination is made whether the liquid level in tank 5 is below the desired liquid level in tank 5. If the liquid level in tank 5 is not below the desired liquid level in tank 5, the operation of pump 46 is maintained. If the liquid level in tank 5 is below the desired liquid level in tank 5, pump 56 is run and valve 58 is opened so that liquid in tank 14 may be pumped to sprayer 45.

In Figure 4, if position sensor 75 senses bottles or containers, the operation of pump 52 is maintained. If position sensor 75 senses no bottles, pump 52 is turned off and a determination is made whether the liquid level in tank 6 is below the desired liquid level in tank 6. If the liquid level in tank 6 is not below the desired liquid level in tank 6, the operation

of pump 47 is maintained. If the liquid level in tank 6 is below the desired liquid level in tank 6, pump 56 is run and valve 59 is opened so that liquid in tank 14 may be pumped to sprayer 44.

In Figure 5, if position sensor 76 senses bottles or containers, the operation of pump 51 is maintained. If position sensor 76 senses no bottles, pump 51 is turned off and a determination is made whether the liquid level in tank 7 is below the desired liquid level in tank 7. If the liquid level in tank 7 is not below the desired liquid level in tank 7, the operation of pump 48 is maintained. If the liquid level in tank 7 is below the desired liquid level in tank 7, pump 56 is run and valve 60 is opened so that liquid in tank 14 may be pumped to sprayer 43.

In Figure 6, if position sensor 79 senses bottles or containers, the operation of pump 48 is maintained. If position sensor 79 senses no bottles, pump 48 is turned off and a determination is made whether the liquid level in tank 10 is below the desired liquid level in tank 10. If the liquid level in tank 10 is not below the desired liquid level in tank 10, the operation of pump 51 is maintained. If the liquid level in tank 10 is below the desired liquid level in tank 10, pump 55 is run and valve 65 is opened so that liquid in tank 17 may be pumped to sprayer 40.

In Figure 7, if position sensor 80 senses bottles or containers, the operation of pump 47 is maintained. If position sensor 80 senses no bottles, pump 47 is turned off and a determination is made whether the liquid level in tank 11 is below the desired liquid level in tank 11. If the liquid level in tank 11 is not below the desired liquid level in tank 11, the operation of pump 52 is maintained. If the liquid level in tank 11 is below the desired liquid level in tank 11, pump 55 is run and valve 66 is opened so that liquid in tank 17 may be pumped to sprayer 39.

In Figure 8, if position sensor 81 senses bottles or containers, the operation of pump 46 is maintained. If position sensor 81 senses no bottles, pump 46 is turned off and a determination is made whether the liquid level in tank 12 is below the desired liquid level in tank 12. If the liquid level in tank 12 is not below the desired liquid level in tank 12, the operation of pump 53 is maintained. If the liquid level in tank 12 is

below the desired liquid level in tank 12, pump 55 is run and valve 67 is opened so that liquid in tank 17 may be pumped to sprayer 38.

In Figure 9, if position sensor 81 senses no bottles and position sensor 74 senses no bottles, pump 53 is turned off. If position sensor 81 senses no bottles and position sensor 74 senses bottles, pump 53 is turned on and a determination is made whether the liquid level in tank 12 is below the desired liquid level in tank 12. If the liquid level in tank 12 is not below the desired liquid level in tank 12, the operation of pump 53 is maintained. If the liquid level in tank 12 is below the desired liquid level in tank 12, pump 55 is run and valve 67 is opened so that liquid in tank 17 may be pumped to sprayer 38.

In Figure 10, if position sensor 80 senses no bottles and position sensor 75 senses no bottles, pump 52 is turned off. If position sensor 80 senses no bottles and position sensor 75 senses bottles, pump 52 is turned on and a determination is made whether the liquid level in tank 11 is below the desired liquid level in tank 11. If the liquid level in tank 11 is not below the desired liquid level in tank 11, the operation of pump 52 is maintained. If the liquid level in tank 11 is below the desired liquid level in tank 11, pump 55 is run and valve 66 is opened so that liquid in tank 17 may be pumped to sprayer 39.

In Figure 11, if position sensor 79 senses no bottles and position sensor 76 senses no bottles, pump 51 is turned off. If position sensor 79 senses no bottles and position sensor 76 senses bottles, pump 51 is turned on and a determination is made whether the liquid level in tank 10 is below the desired liquid level in tank 10. If the liquid level in tank 10 is not below the desired liquid level in tank 10, the operation of pump 51 is maintained. If the liquid level in tank 10 is below the desired liquid level in tank 10, pump 55 is run and valve 65 is opened so that liquid in tank 17 may be pumped to sprayer 40.

In Figure 12, if position sensor 76 senses no bottles and position sensor 79 senses no bottles, pump 48 is turned off. If position sensor 76 senses no bottles and position sensor 79 senses bottles, pump 48 is turned on and a determination is made whether the liquid level in tank 7 is below the desired liquid level in tank 7. If the liquid level in tank 7 is not below the

desired liquid level in tank 7, the operation of pump 48 is maintained. If the liquid level in tank 7 is below the desired liquid level in tank 7, pump 56 is run and valve 60 is opened so that liquid in tank 14 may be pumped to sprayer 43.

In Figure 13, if position sensor 75 senses no bottles and position sensor 80 senses no bottles, pump 47 is turned off. If position sensor 75 senses no bottles and position sensor 80 senses bottles, pump 47 is turned on and a determination is made whether the liquid level in tank 6 is below the desired liquid level in tank 6. If the liquid level in tank 6 is not below the desired liquid level in tank 6, the operation of pump 47 is maintained. If the liquid level in tank 6 is below the desired liquid level in tank 6, pump 56 is run and valve 59 is opened so that liquid in tank 14 may be pumped to sprayer 44.

In Figure 14, if position sensor 74 senses no bottles and position sensor 81 senses no bottles, pump 46 is turned off. If position sensor 74 senses no bottles and position sensor 81 senses bottles, pump 46 is turned on and a determination is made whether the liquid level in tank 5 is below the desired liquid level in tank 5. If the liquid level in tank 5 is not below the desired liquid level in tank 5, the operation of pump 46 is maintained. If the liquid level in tank 5 is below the desired liquid level in tank 5, pump 56 is run and valve 58 is opened so that liquid in tank 14 may be pumped to sprayer 45.

In Figure 15, if position sensors 74, 75, and 76 all sense bottles, operation of pumps 51, 52, and 53 is maintained. If position sensors 74, 75, and 76 all sense no bottles, pumps 51, 52, 53, and 55 are turned off and valves 65, 66, and 67 are closed.

In Figure 16, if position sensors 77 and 78 both sense bottles, operation of pumps 49 and 50 is maintained. If position sensors 77 and 78 both sense no bottles, pumps 49, 50, 54, and 55 are turned off and valves 61, 62, 63, and 64 are closed.

In Figure 17, if position sensors 79, 80, and 81 all sense bottles, operation of pumps 46, 47, and 48 is maintained. If position sensors 79, 80, and 81 all sense no bottles, pumps 46, 47, 48, and 56 are turned off and valves 58, 59, and 60 are closed.

In Figure 18, if position sensors 74, 75, 76, 77, 78, 79, 80, and 81 all sense no bottles, pumps 46-53, 55 and 56 are turned off and valves 58-67 are closed but pump 54 is left on.

A person skilled in computer art, for example, would be able to determine from this specification and the drawings for this application, with minimum experimentation or without undue experimentation, the operation of the pasteurization system, possibly including interruption, stoppage, or startup of the pasteurization system, as it relates to, for example, position sensors 77 and 78, sprayers 41 and 42, tanks 8, 9, 13, 15, and 16, liquid level sensors 27 and 29, temperature sensors 26 and 28, valves 61-64, overflow devices 69, 70, 72, and pumps 49, 50, 54, and 55.

In at least one possible embodiment of the present invention, all or at least some of the components of the pasteurization system can be controlled manually by the control system 18, a display 82, and a control panel 83, which control system 18, display 82, and control panel 83 are shown in Figures 19 and 19A. In Figures 19 and 19A, both the display 82 and the control panel 83 are connected to the control system 18 and to each other. The control panel 83 may be operated by means of switches, and information relating to the control panel 83 is displayed on the display 82. The control system 18 in Figures 19 and 19A is connected to and controls pumps 46-56; valves 58-67; position sensors 74-81; liquid level sensors 21, 23, 25, 27, 29, 31, 33, and 35; temperature sensors 20, 22, 24, 26, 28, 30, 32, and 34; and the heat exchanger 57. A person skilled in the art would be able to determine, with minimum experimentation or without undue experimentation, manual operation of the pasteurization system and control arrangement shown in Figures 19 and 19A.

One feature of the invention resides broadly in the method for the pasteurization of products in containers in a continuous container flow 1 by stationary, sequential sections for heating 2, pasteurizing 3 and cooling 4 by means of overflowing liquid, whereby the sections are graduated with respect to one another in terms of their liquid temperature, and for purposes of efficient heat exchange, recovery, or recycling are organized in pairs, so that the liquid is transported by overflow from a heating zone to a cooling zone and the liquid overflowing from this cooling zone

is transported to the heating zone, and to set the desired temperature of the overflowing liquid, warmer or cooler liquid is added to the liquid being transported, characterized by the fact that the excess liquid in the heating section 2 added by the temperature regulation process to the zones in the method over-flows in a cascade fashion from zone to zone of increasing overflow temperature, and in the cooling section 4 overflows in cascade fashion from zone to zone of decreasing overflow temperature, and from the last zone, i.e the hottest zone 7 in the heating section overflows into a warm liquid reservoir 13, and from the coldest zone 10 in the cooling section into a cold liquid reservoir 14, and the excess fluid added by the regulation process to the pasteurizing section overflows from the zones into a hot liquid reservoir 15.

Another feature of the invention resides broadly in the method characterized by the fact that the liquid contained in the cold fluid reservoir 14 is used in a controlled fashion for cooling at least of the zones in the cooling section 4 and in the pasteurizing section 3, the fluid contained in the warm liquid reservoir 13 is used in a controlled fashion for the heating of at least the zones in the heating section 2 or for cooling of the zones in the pasteurizing section 3, and the liquid contained in the hot liquid reservoir 15, after the addition of thermal energy, can be used in a controlled fashion to heat at least the zones in the pasteurizing section 3.

Yet another feature of the invention resides broadly in the method characterized by the fact that the cold liquid reservoir 14 can overflow into the warm liquid reservoir 13.

Still another feature of the invention resides broadly in the method characterized by the fact that the hot liquid reservoir 15 can overflow into the warm liquid reservoir 13.

A further feature of the invention resides broadly in the method, characterized by the fact that the warm liquid reservoir 13 and the hot liquid reservoir 15 are divided in the direction of flow.

Another feature of the invention resides broadly in the method characterized by the fact that associated with the warm and hot liquid reservoirs 13, 15 are respective additional containers 16, 17 for the overflowing liquid.

Yet another feature of the invention resides broadly in the apparatus for the performance of the method described in the preceding claims, with a conveyor and a plurality of successive handling sections in a pasteurizing tunnel, characterized by the fact that the water of the heating zones 4-7 is conducted at least in part to the respective downstream zones of higher temperature, and no later than upstream of the superheating zone 8 is diverted into a first tank 13 of higher temperature, and the water of at least the superheating zone 8 and/or of the pasteurizing zone 9 can be fed to a second tank 15 of higher temperature, and this second tank 15 corresponds to an additional third tank 16 which is realized in the form of a hot water tank with a heating device, and there is a fourth tank 14 which is fed the water from the cooling zone 12, whereby this water can also be forcibly transported to the heating zone 5, and the water of the third tank 16 can be fed at least to the superheating and/or pasteurizing zone 8, 9.

Some examples of computer systems and methods and their components that may be used or adapted for use in at least one possible embodiment of the present invention may be found in U.S. Patent No. 5,379,428, entitled "Hardware Process Scheduler and Processor Interrupter for Parallel Processing Computer Systems" and issued to Belo on January 3, 1995; U.S. Patent No. 5,398,333, entitled "Personal Computer Employing Reset Button to Enter ROM-based Diagnostics" and issued to Shieve et al. on March 14, 1995; U.S. Patent No. 5,390,301, entitled "Method and Apparatus for Communicating Device-Specific Information Between a Device Driver and an Operating System in a Computer System" and issued to Scherf on February 14, 2995; U.S. Patent No. 5,404,544, entitled "System for Periodically Transmitting Signal to/from Sleeping Node Identifying its Existence to a Network and Awakening the Sleeping Node Responding to Received Instruction" and issued to Crayford on April 4, 1995; U.S. Patent No. 5,418,942, entitled "System and Method for Storing and Managing Information" and issued to Krawchuk on May 23, 1995; U.S. Patent No. 5,479,355, entitled "System and Method for a Closed Loop Operation of Schematic Designs with Electrical Hardware" and issued to Hyduke on December 26, 1995; and U.S. Patent No. 5,428,790, entitled "Computer Power Management System" and issued to Harper et al. on June 27, 1995.

Some examples of switches or levers, or components thereof, that may be used or adapted for use in at least one possible embodiment of the present invention may be found in U.S. Patent No. 5,392,895, entitled "Transfer Unit" and issued to Sorensen on February 28, 1995; U.S. Patent No. 5,404,992, entitled "Suspension Conveyor System" and issued to Robu et al. on April 11, 1995; U.S. Patent No. 5,438,911, entitled "Control Cylinder for Pneumatic Control Devices with Signal Switches" and issued to Fiedler et al. on August 8, 1995; U.S. Patent No. 5,440,289, entitled "Combined Alarm System and Window Covering Assembly" and issued to Riordan on August 8, 1995; and U.S. Patent No. 5,462,245, entitled "Apparatus for Locking Moveable Switch Parts" and issued to Durchschlag on October 31, 1995.

Some examples of sensors and switches that may be used or adapted for use in at least one possible embodiment of the present invention may be found in U.S. Patent No. 5,379,023, entitled "Alarm System" and issued to Dalton on January 3, 1995; U.S. Patent No. 5,453,589, entitled "Microswitch with Non-enlarging, Sealed Electrical Connections" and issued to Mayer on September 26, 1995; U.S. Patent No. 5,453,590, entitled "Bistable Microswitch" and issued to Mayer on September 26, 1995; U.S. Patent No. 5,378,865, entitled "Multi-directional Shock Sensor" and issued to Reneau on January 3, 1995; U.S. Patent No. 5,408,132, entitled "Proximity Switch Operating in a Non-Contacting Manner" and issued to Fericean et al. on April 18, 1995; U.S. Patent No. 5,428,253, entitled "Proximity Switch" and issued to Ogata et al. on June 27, 1995; 5,442,150, entitled "Piezo Electric Switch" and issued to Ipcinski on August 15, 1995; U.S. Patent No. 5,430,421, entitled "Reed Contactor and Process of Fabricating Suspended Tridimensional Metallic Microstructure" and issued to et al. on July 4, 1994; and U.S. Patent No. 5,444,295, entitled "Linear Dual Switch Module" and issued to Lake et al. on August 22, 1995.

Some examples of sensors, sensor systems, gauges, or gauge systems that may be used or adapted for use in at least one possible embodiment of the present invention may be found in the following U.S. patents: No. 6,016,697, issued to inventors McCulloch et al. on January 25, 2000; No. 5,857,482, issued to inventor Dowling on January 12, 1999; No. 5,785,100, issued to

inventors Showalter et al. on July 28, 1998 No. 5,699,049, issued to inventor Difiore on December 16, 1997; No. 5,651,285, issued to inventor Legras on July 29, 1997; No. 5,627,523, issued to inventors Besprozvanny et al. on May 6, 1997; No. 5,581,062, issued to inventor Gomez, Jr. on December 3, 1996; No. 5,105,668, issued to inventors Ficken et al. on April 21, 1992; No. 5,056,363, issued to inventors Arekapudi et al. on October 15, 1991; No. 5,054,319, issued to inventor Fling on October 8, 1991; No. 4,962,395, issued to inventor Baird on October 9, 1990; No. 4,935,727, issued to inventors Re Fiorentin et al. on June 19, 1990; No. 4,917,173, issued to inventors Brown et al. on April 17, 1990; No. 4,838,303, issued to inventor Goans on June 13, 1989; No. 4,825,695, issued to inventor Ohtani on May 2, 1989; No. 4,777,821, issued to inventor Gerve on October 18, 1988; No. 4,715,398, issued to inventors Shouldice et al. on December 29, 1987; No. 4,497,205, issued to inventors Zulauf et al. on February 5, 1985; No. 4,467,156, issued to inventors Dvorak et al. on August 21, 1984; No. 4,383,544, issued to inventor Vosper on May 17, 1983; No. 4,379,434, issued to inventor Thordarson on April 12, 1983; No. 4,205,237, issued to inventor Miller on May 27, 1980; No. 4,194,395, issued to inventor Wood on March 25, 1980; No. 4,171,932, issued to inventor Miller on October 23, 1979; No. 4,087,012, issued to inventor Fogg on May 2, 1978; and No. 4,021,122, issued to inventor Krenmayr on May 3, 1977.

Some examples of temperature sensors or sensor systems that may be used or adapted for use in at least one possible embodiment of the present invention may be found in the following U.S. patents: No. 5,960,857, issued to inventors Oswalt et al. on October 5, 1999; No. 5,942,980, issued to inventors Hoben et al. on August 24, 1999; No. 5,881,952, issued to inventor MacIntyre on March 16, 1999; No. 5,862,669, issued to inventors Davis et al. on January 26, 1999; No. 5,459,890, issued to inventor Jarocki on October 24, 1995; No. 5,367,602, issued to inventor Stewart on November 22, 1994; No. 5,319,973, issued to inventors Crayton et al. on June 14, 1994; No. 5,226,320, issued to inventors Dages et al. on July 13, 1993; No. 5,078,123, issued to inventors Nagashima et al. on January 7, 1992; and No. 5,068,030, issued to inventor Chen on November 26, 1991.

Some examples of position sensors or position sensor systems that may be used or adapted for use in at least one possible embodiment of the present invention may be found in the following U.S. patents: No. 5,794,355, issued to inventor Nickum on August 18, 1998; No. 5,520,290, issued to inventors Kumar et al. on May 28, 1996; No. 5,074,053, issued to inventor West on December 24, 1991; and No. 4,087,012, issued to inventor Fogg on May 2, 1978.

Some examples of heaters or heat exchangers, cooling systems, valves, pumps, or tanks that may be used or adapted for use in at least one possible embodiment of the present invention may be found in the following U.S. patents: No. 5,881,952, issued to inventor MacIntyre on March 16, 1999; No. 5,862,669, issued to inventors Davis et al. on January 26, 1999; No. 5,459,890, issued to inventor Jarocki on October 24, 1995; No. 5,367,602, issued to inventor Stewart on November 22, 1994; No. 5,319,973, issued to inventors Crayton et al. on June 14, 1994; No. 5,226,320, issued to inventors Dages et al. on July 13, 1993; No. 5,078,123, issued to inventors Nagashima et al. on January 7, 1992; and No. 5,068,030, issued to inventor Chen on November 26, 1991.

Some examples of conveyor belts or conveyor arrangements and components thereof that may be used or adapted for use in at least one possible embodiment of the present invention may be found in the following U.S. patents: No. 5,999,099, issued to inventor Stobbe on December 7, 1999; No. 5,960,933, issued to inventor Albrecht on October 5, 1999; No. 5,881,429, issued to inventor Drewitz on March 16, 1999; No. 5,873,946, issued to inventor Hantmann on February 23, 1999; No. 5,520,290, issued to inventors Kumar et al. on May 28, 1996; No. 5,429,651, issued to inventor Bolin on July 4, 1995; No. 5,411,129, issued to inventor Crouch on May 2, 1995; No. 5,293,888, issued to inventors Avelis et al. on March 15, 1994; No. 5,107,980, issued to inventor Piazza on April 28, 1992; and No. 5,038,917, issued to inventor Kronseder on August 13, 1991.

The components disclosed in the various publications disclosed or incorporated by reference herein, may be used in the embodiments of the present invention, as well as equivalents thereof.

The appended drawings in their entirety, including all dimensions, proportions, and/or shapes in at least one embodiment of the invention, are accurate and to scale and are hereby included by reference into this specification.

All, or substantially all, of the components and methods of the various embodiments may be used with at least one embodiment or all of the embodiments, if more than one embodiment is described herein.

The corresponding foreign patent publication applications, namely, Federal Republic of Germany Patent Application No. P 199 080 35.6, filed on February 24, 1999, having inventors Gisbert Strohn, Ulrich Wiedemann, Bernd Molitor and Falk Dittrich, and DE-OS P 199 080 35.6 and DE-PS P 199 080 35.6, as well as their published equivalents, and other equivalents or corresponding applications, if any, in corresponding cases in the Federal Republic of Germany and elsewhere, and the references cited in any of the documents cited herein, are hereby incorporated by reference as if set forth in their entirety herein.

Although only a few exemplary embodiments of this invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the following claims. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures.

The invention as described hereinabove in the context of the preferred embodiments is not to be taken as limited to all of the provided details thereof, since modifications and variations thereof may be made without departing from the spirit and scope of the invention.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method for the pasteurization of products in containers in a continuous container flow (1) by stationary, sequential sections for heating (2), pasteurizing (3) and cooling (4) by means of overflowing liquid, whereby the sections are graduated with respect to one another in terms of their liquid temperature, and for purposes of efficient heat exchange are organized in pairs, so that the liquid is transported by overflow from a heating zone to a cooling zone and the liquid overflowing from this cooling zone is transported to the heating zone, and to set the desired temperature of the overflowing liquid, warmer or cooler liquid is added to the liquid being transported, characterized by the fact that the excess liquid in the heating section (2) added by the temperature regulation process to the zones in the method overflows in a cascade fashion from zone to zone of increasing overflow temperature, and in the cooling section (4) overflows in cascade fashion from zone to zone of decreasing overflow temperature, and from the last zone, i.e the hottest zone (7) in the heating section overflows into a warm liquid reservoir (13), and from the coldest zone (10) in the cooling section into a cold liquid reservoir (14), and the excess fluid added by the regulation process to the pasteurizing section overflows from the zones into a hot liquid reservoir (15).

2. The method according to Claim 1, characterized by the fact that the liquid contained in the cold fluid reservoir (14) is used in a controlled fashion for cooling at least of the zones in the cooling section (4) and in the pasteurizing section (3), the fluid contained in the warm liquid reservoir (13) is used in a controlled fashion for the heating of at least the zones in the heating section (2) or for cooling of the zones in the pasteurizing section (3), and the liquid contained in the hot liquid reservoir (15), after the addition of thermal energy, can be used in a controlled fashion to heat at least the zones in the pasteurizing section (3).

3. The method according to Claim 2, characterized by the fact that the cold liquid reservoir (14) can overflow into the warm liquid reservoir (13).

4. The method according to Claim 3, characterized by the fact that the hot liquid reservoir (15) can overflow into the warm liquid reservoir (13).

5. The method according to Claim 4, characterized by the fact that the warm liquid reservoir (13) and the hot liquid reservoir (15) are divided in the direction of flow.

6. The method according to Claim 5, characterized by the fact that associated with the warm and hot liquid reservoirs (13, 15) are respective additional containers (16, 17) for the overflowing liquid.

7. An apparatus for performing the method according to Claim 1, with a conveyor and a plurality of successive handling sections in a pasteurizing tunnel, characterized by the fact that the water of the heating zones (4-7) is conducted at least in part to the respective downstream zones of higher temperature, and no later than upstream of the superheating zone (8) is diverted into a first tank (13) of higher temperature, and the water of at least the superheating zone (8) and/or of the pasteurizing zone (9) can be fed to a second tank (15) of higher temperature, and this second tank (15) corresponds to an additional third tank (16) which is realized in the form of a hot water tank with a heating device, and there is a fourth tank (14) which is fed the water from the cooling zone (12), whereby this water can also be forcibly transported to the heating zone (5), and the water of the third tank (16) can be fed at least to the superheating and/or pasteurizing zone (8, 9).

# OPERATING PROCEDURE FOR A PASTEURIZING FACILITY

## ABSTRACT OF THE DISCLOSURE

A method and an apparatus therefor for the pasteurization of products in containers in a continuous container flow by stationary, sequential sections for heating, pasteurizing, and cooling by means of overflowing liquid, whereby the sections are graduated with respect to one another in terms of their liquid temperature, and for purposes of efficient heat exchange are organized in pairs, so that the liquid is transported by overflow from a heating zone to a cooling zone and the liquid overflowing from this cooling zone is transported to the heating zone, and to set the desired temperature of the overflowing liquid, warmer or cooler liquid is added to the liquid being transported, characterized by the fact that the excess liquid in the heating section added by the temperature regulation process to the zones in the method overflows in a cascade fashion from zone to zone of increasing overflow temperature, and in the cooling section overflows in cascade fashion from zone to zone of decreasing overflow temperature, and from the hottest zone in the heating section overflows into a warm liquid reservoir, and from the coldest zone in the cooling section into a cold liquid reservoir, and the excess fluid added by the regulation process to the pasteurizing section overflows from the zones into a hot liquid reservoir.

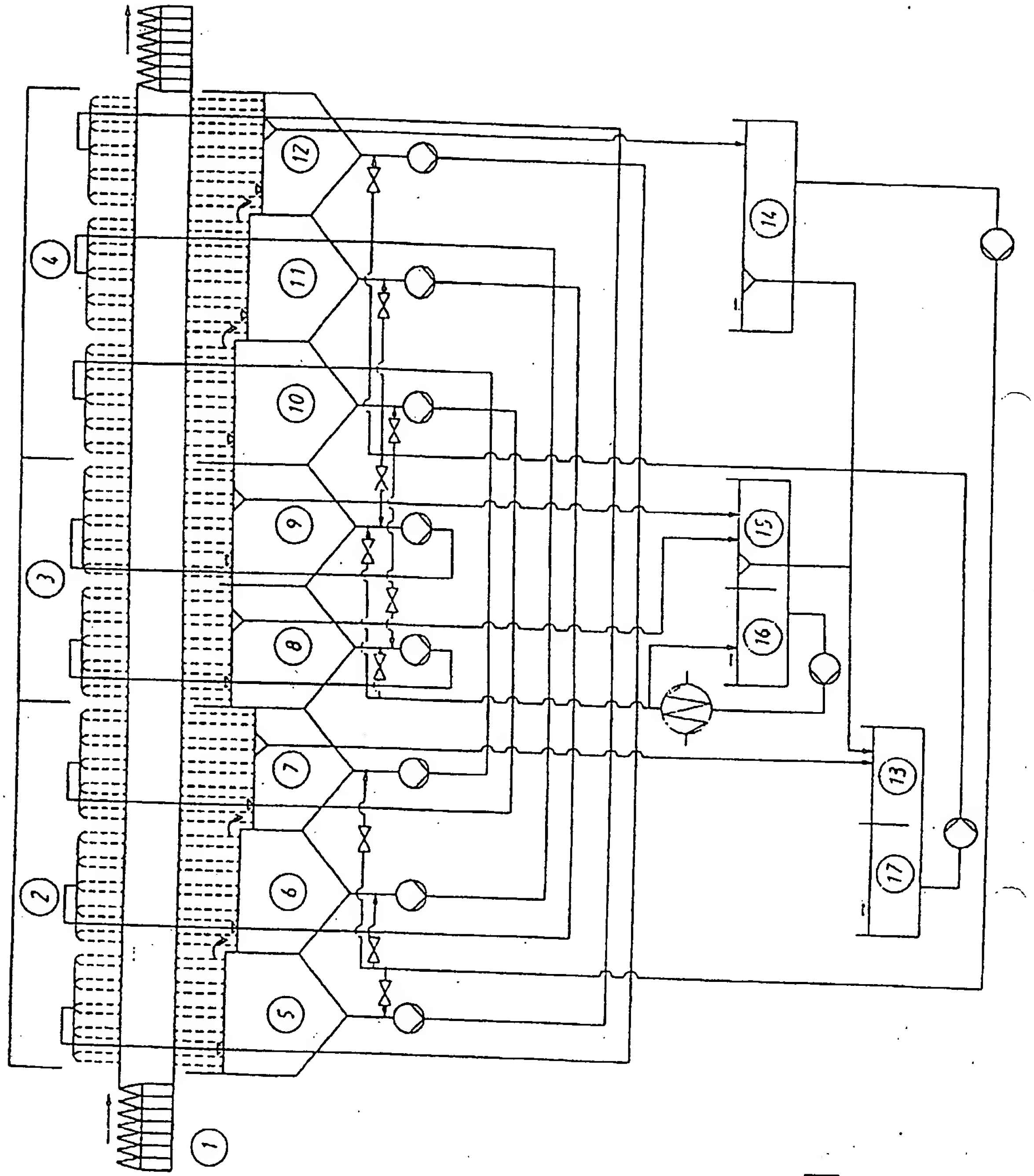


FIG. 1

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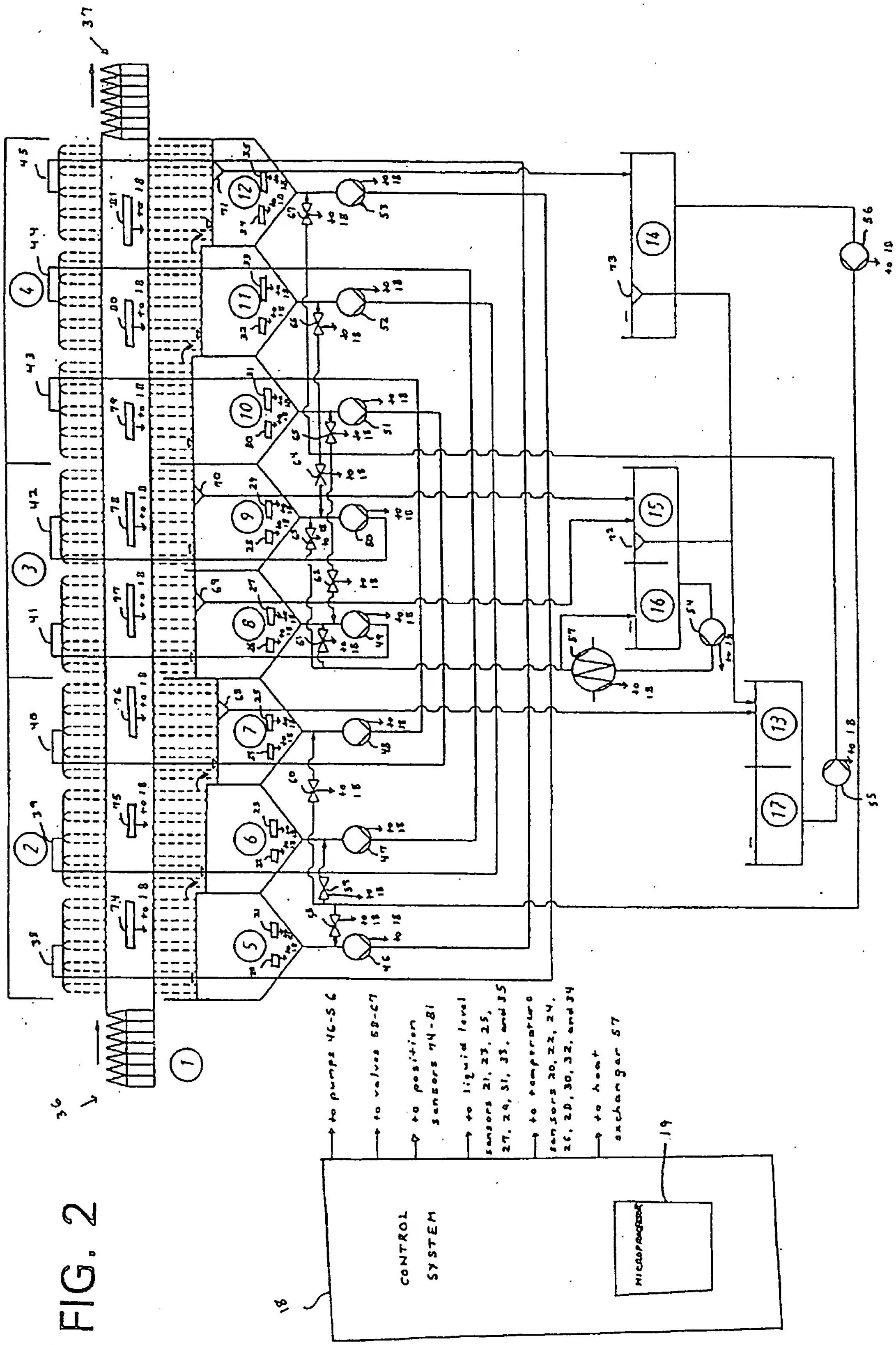


FIG. 2

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FIG. 2A

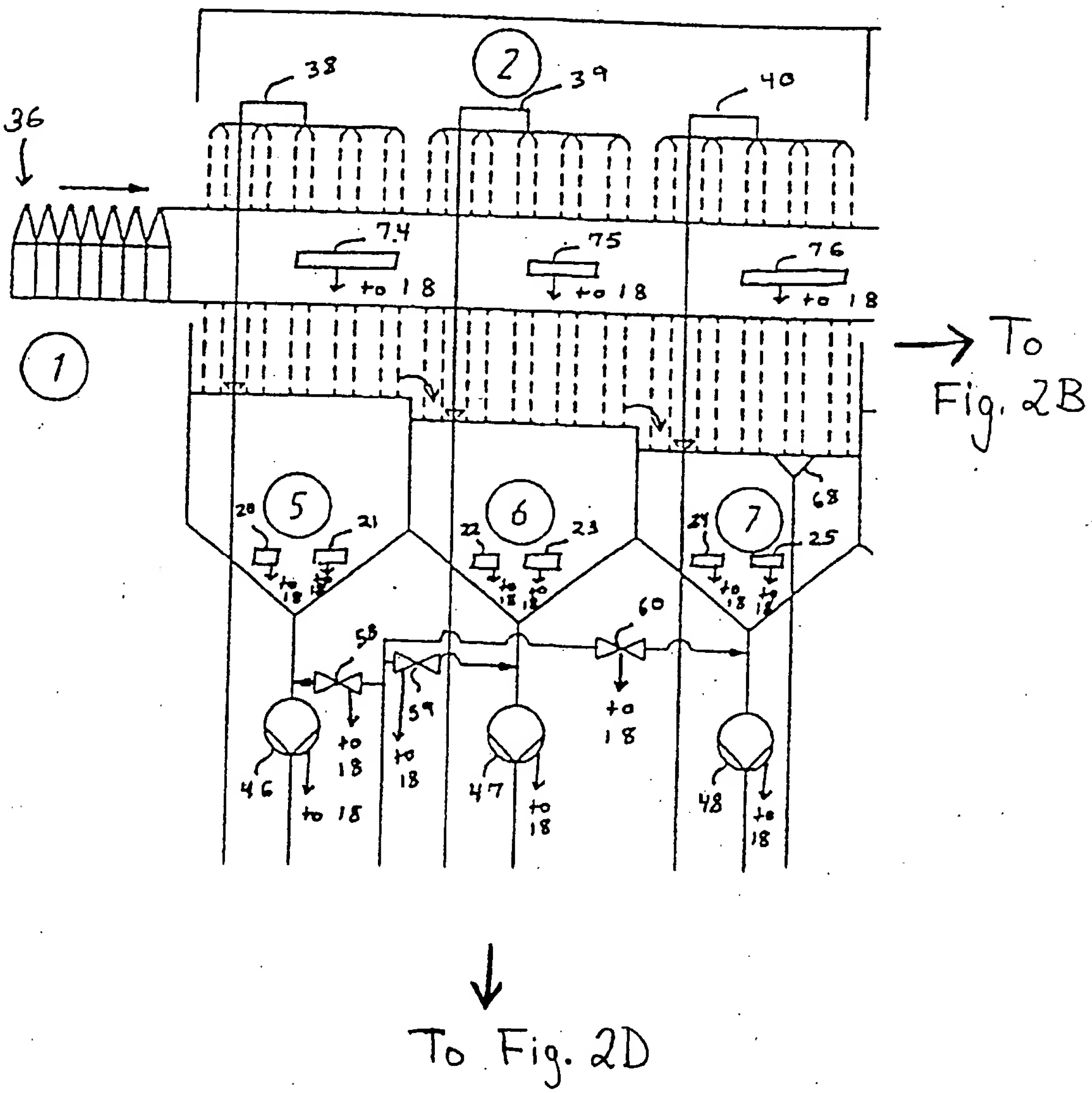


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FIG. 2B

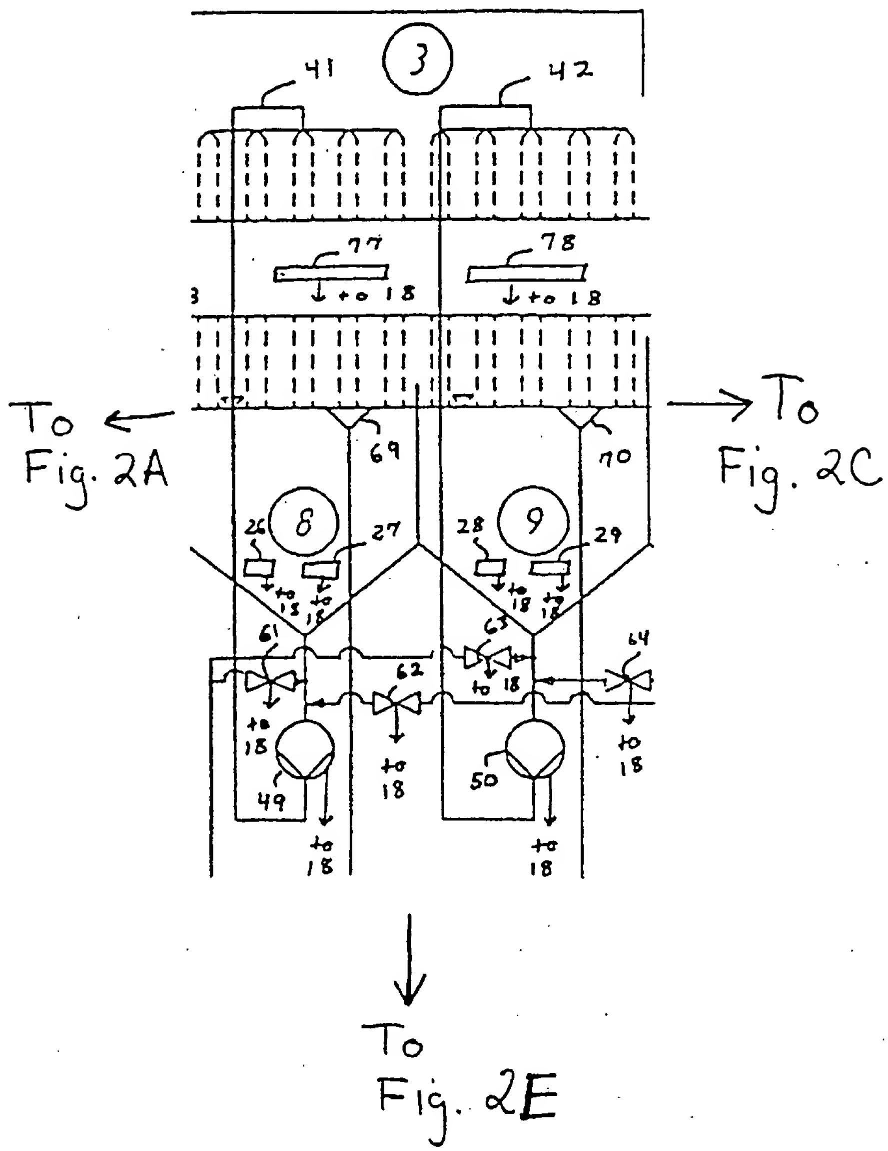


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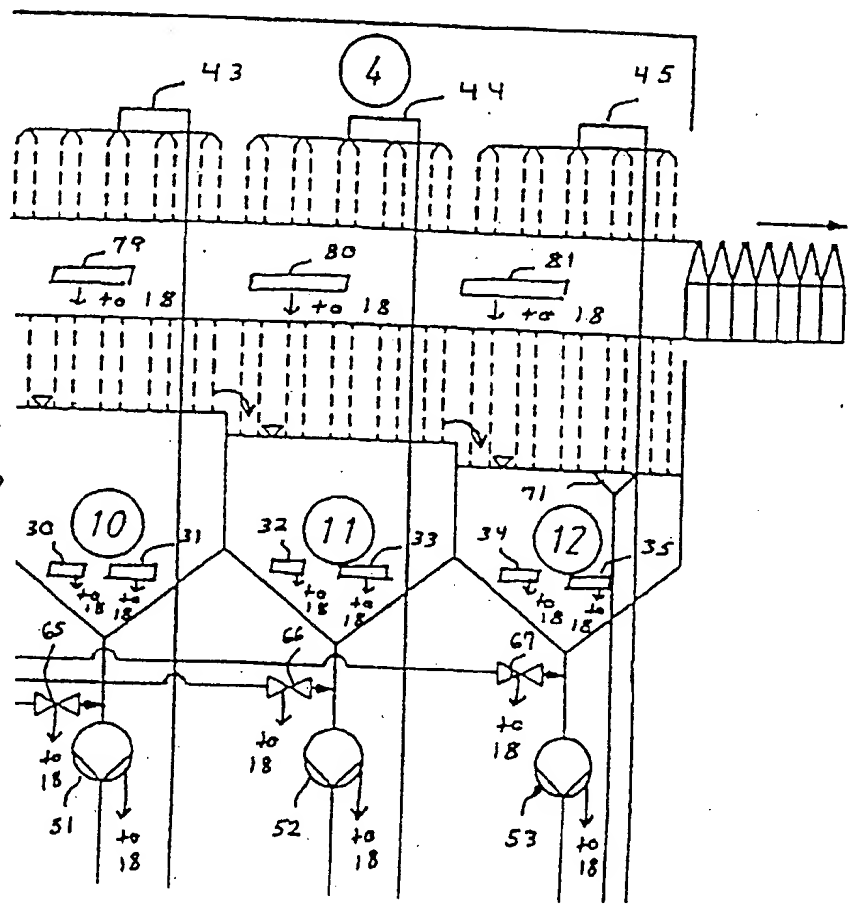
FIG. 2C

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To Fig. 2F

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FIG. 2D

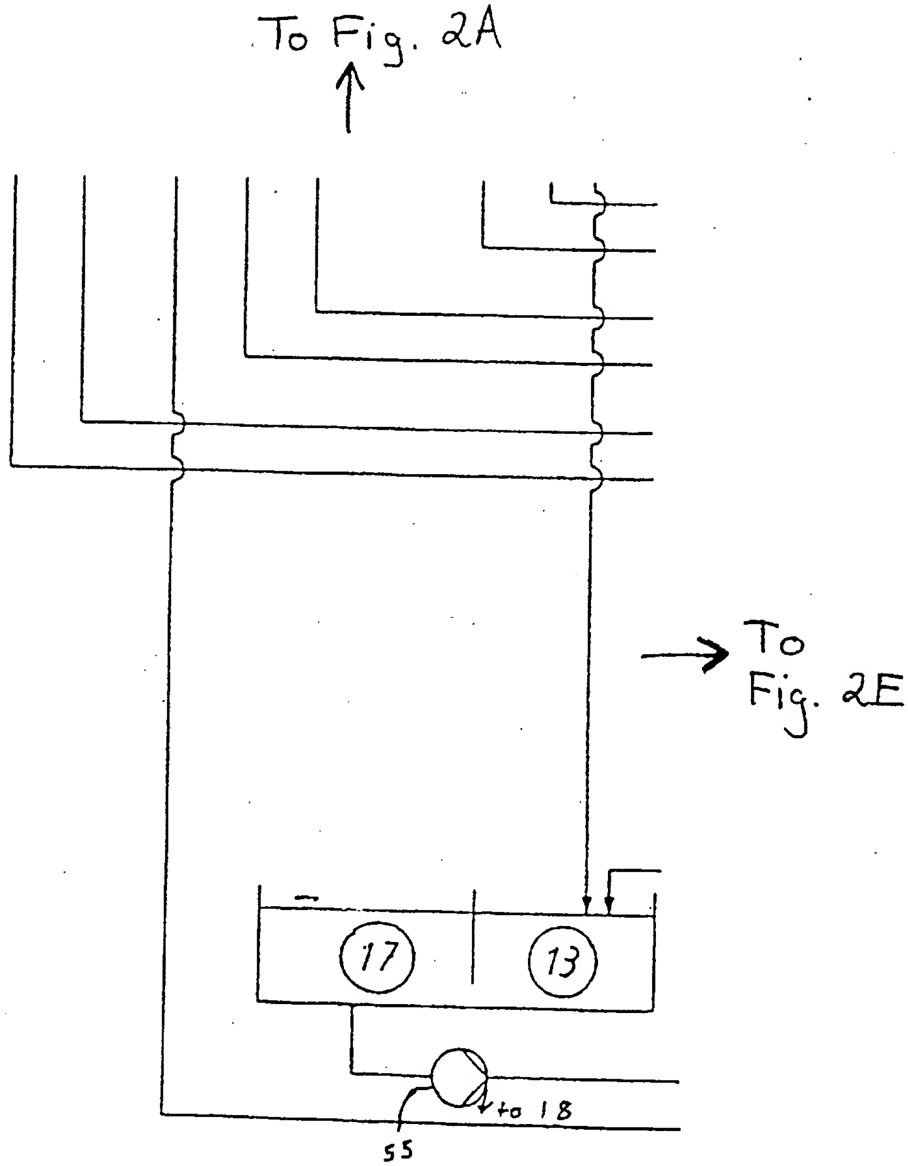


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FIG. 2E

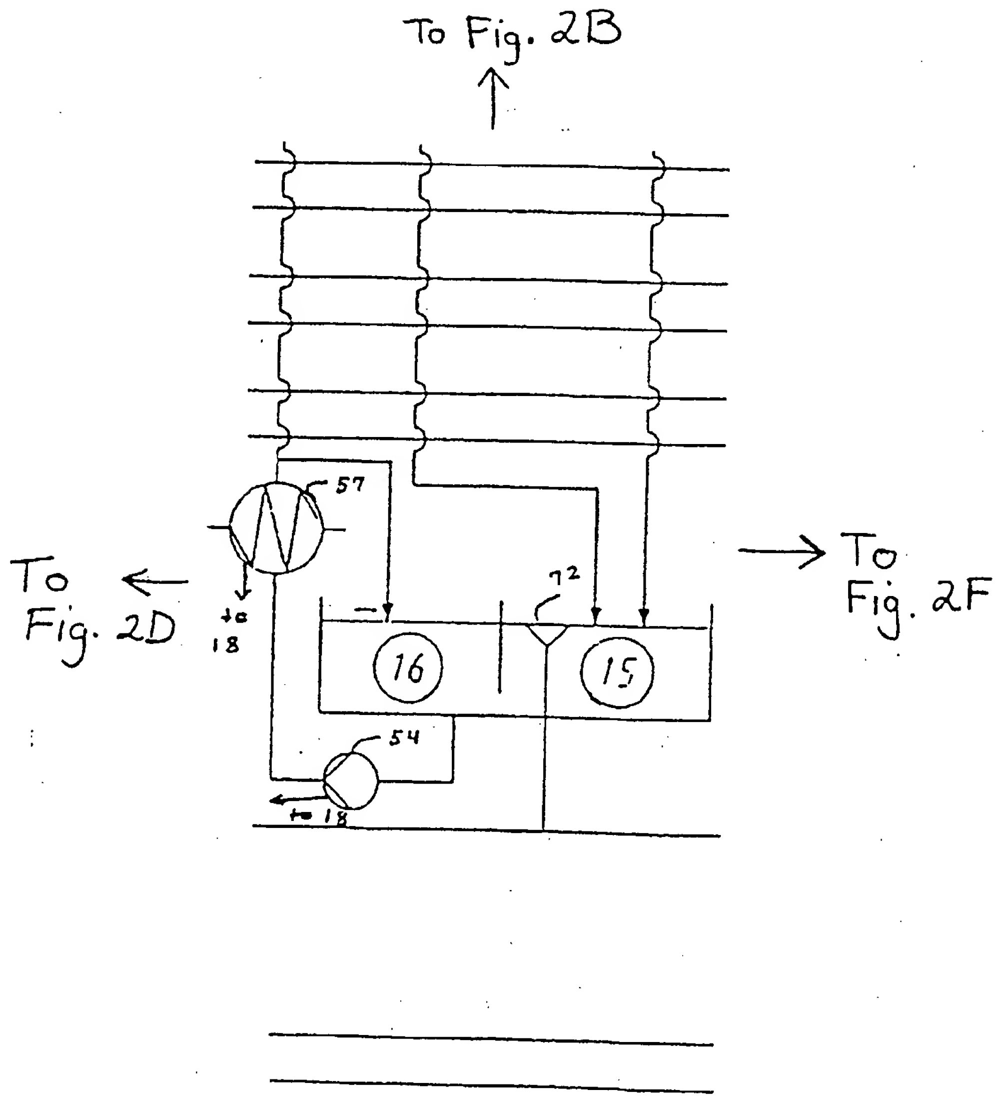


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FIG. 2F

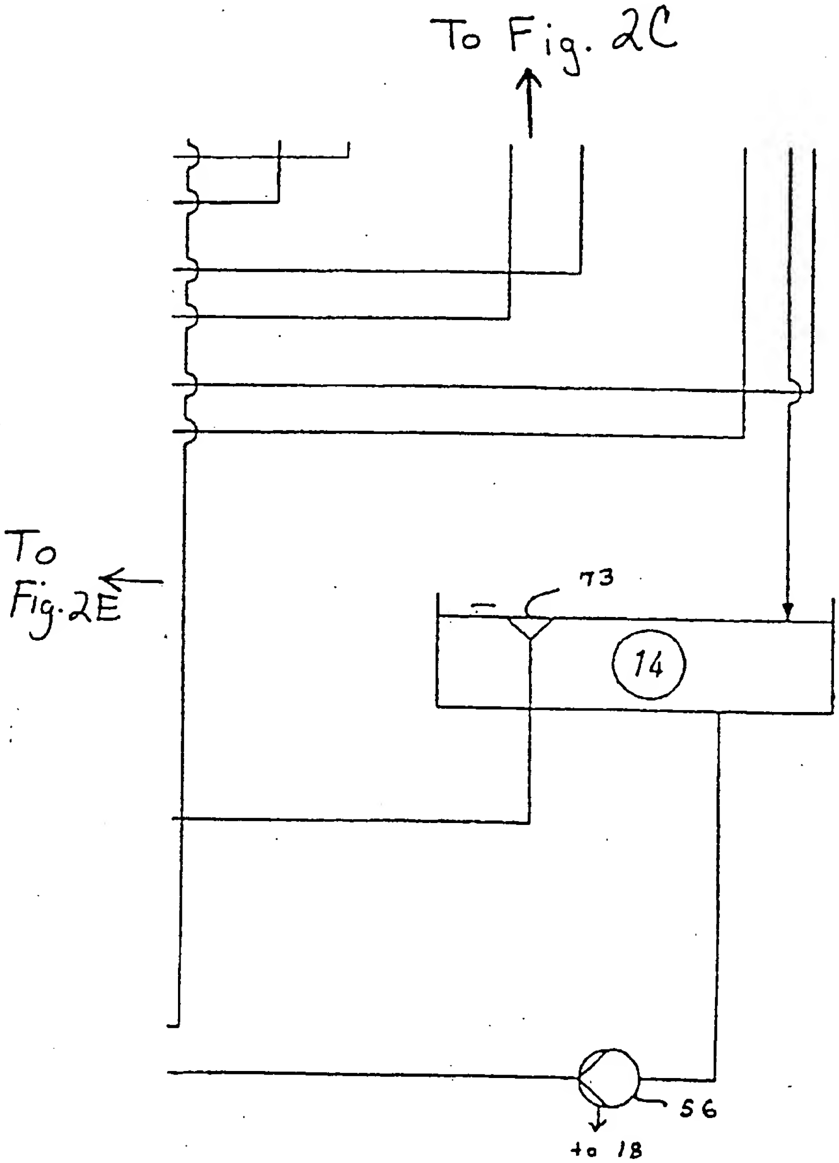


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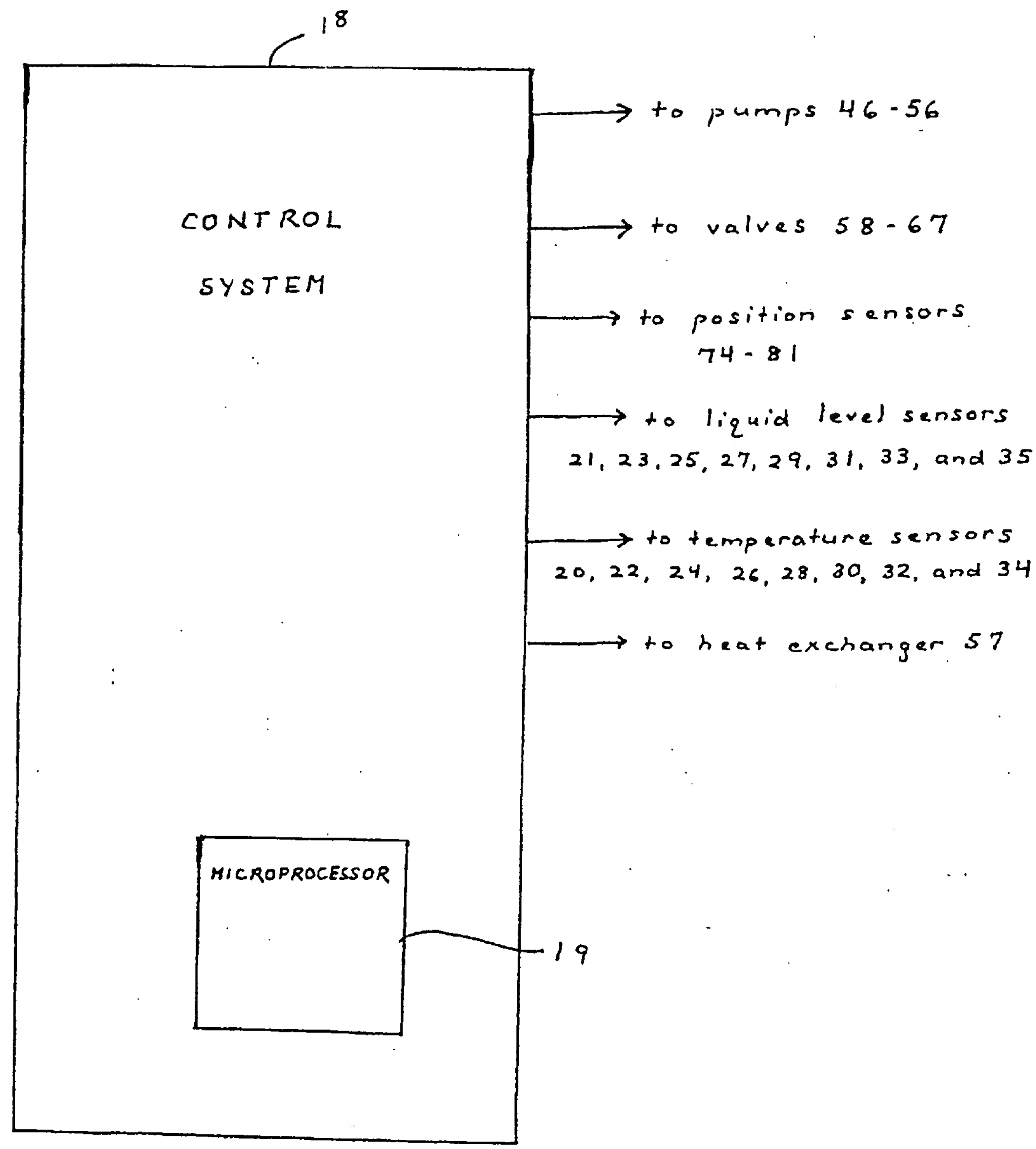
FIG. 2G

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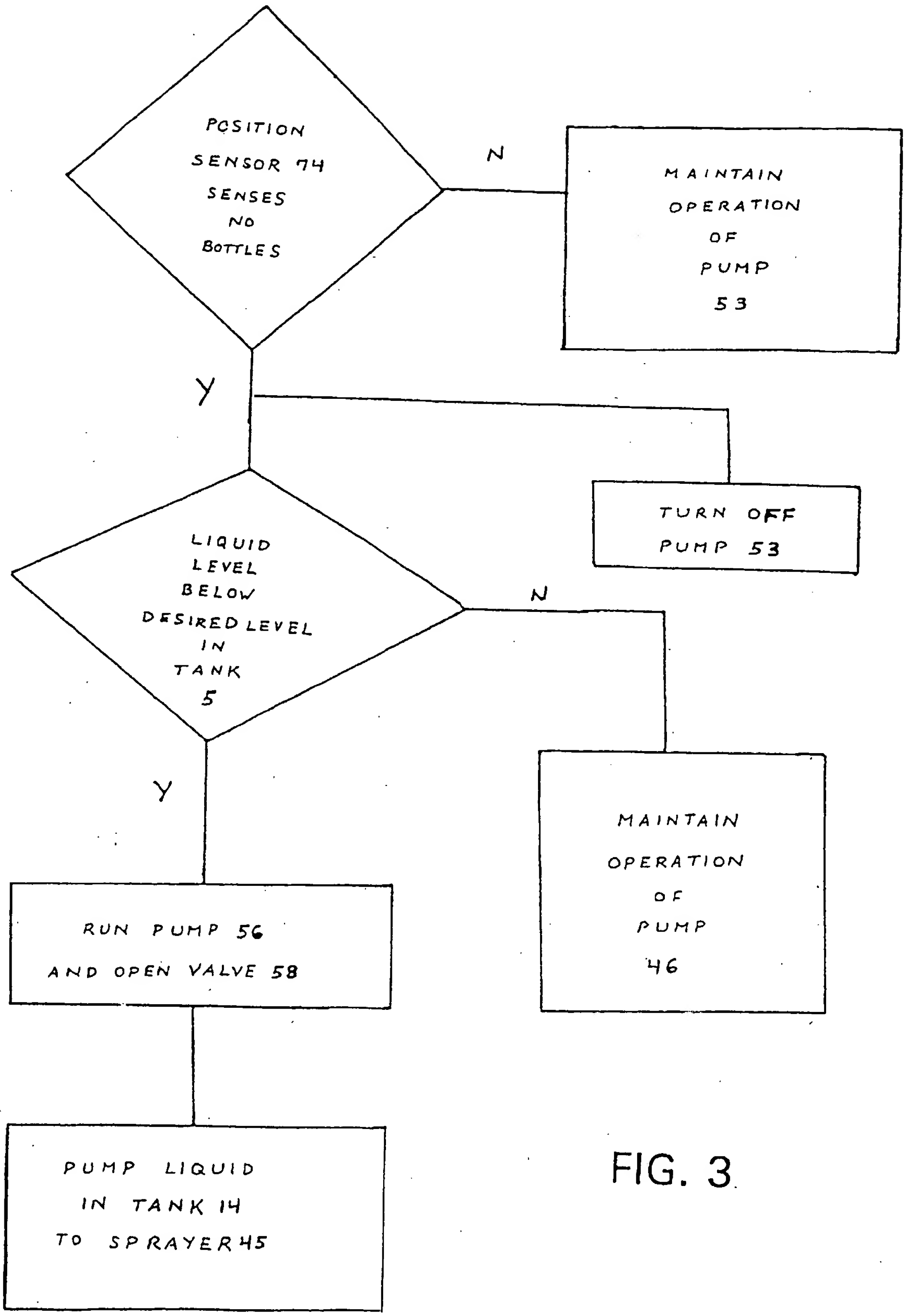


FIG. 3

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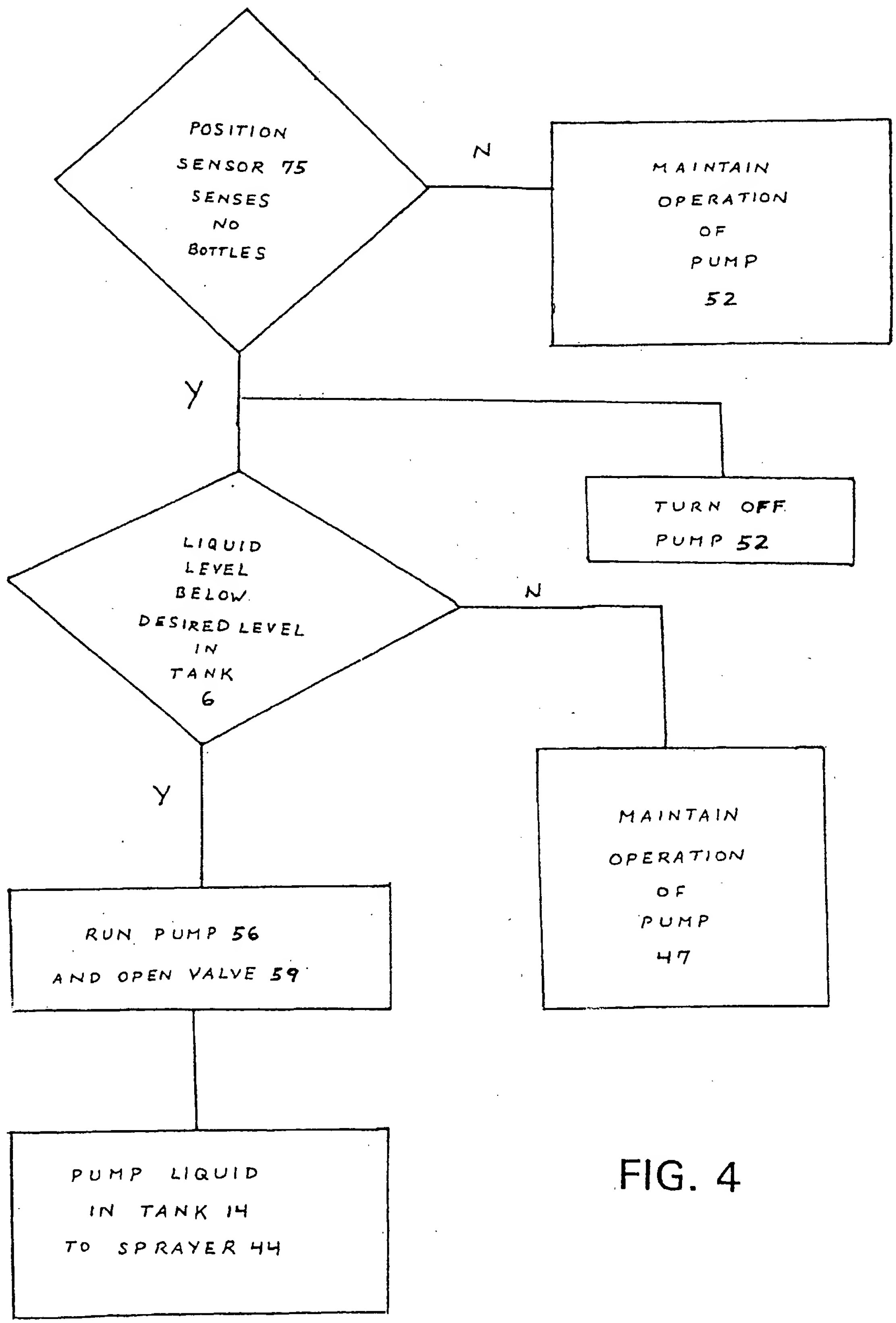


FIG. 4

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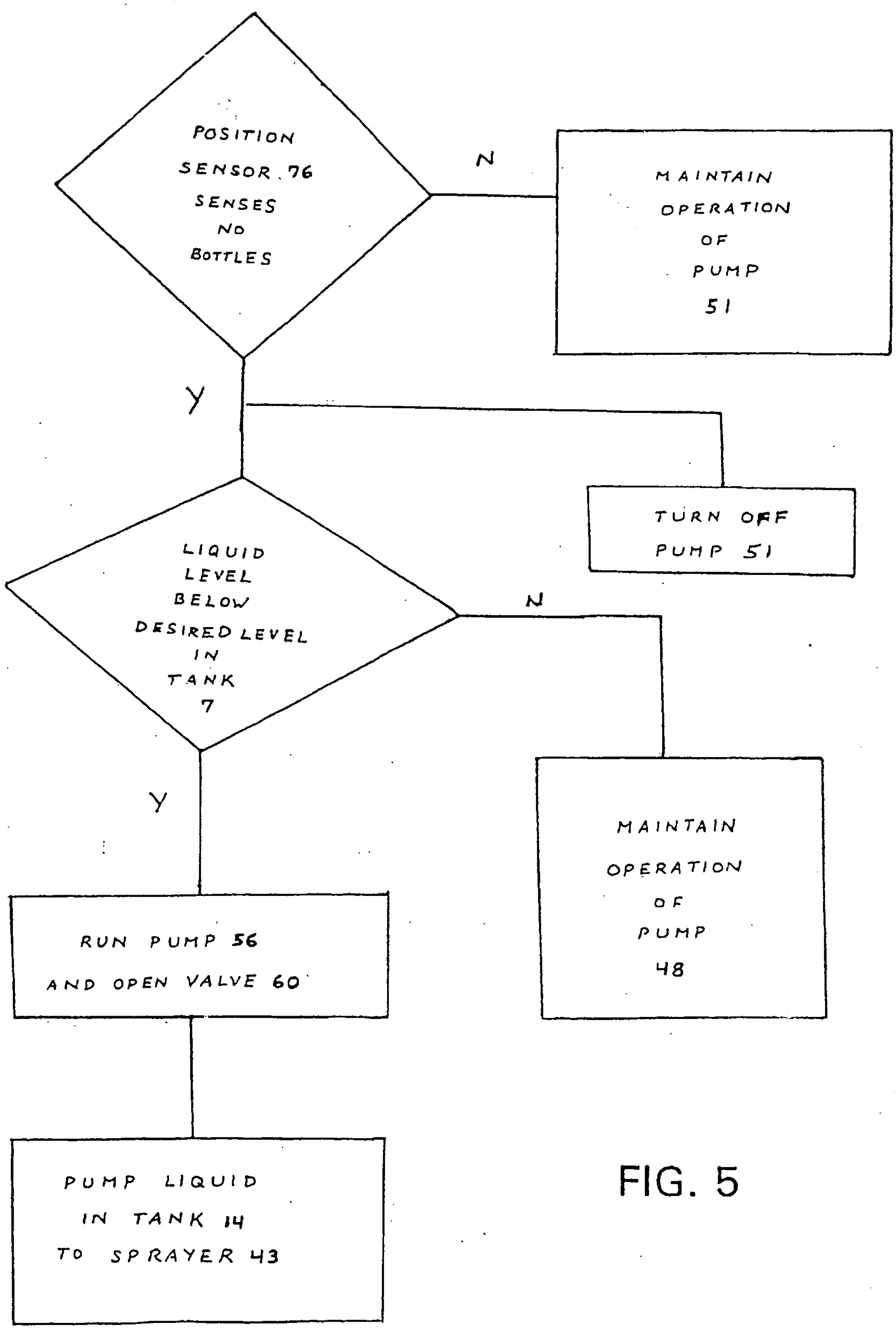


FIG. 5

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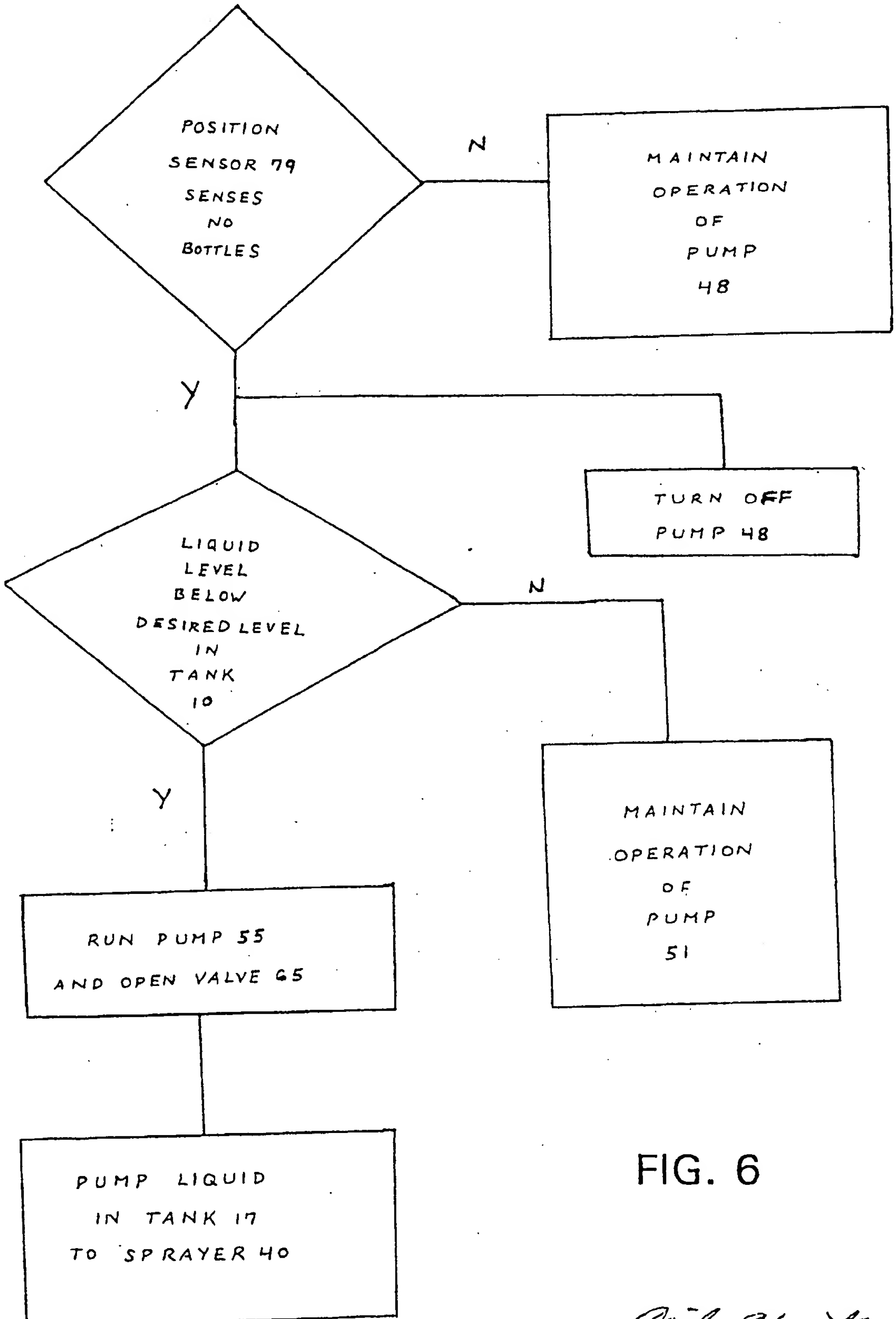


FIG. 6

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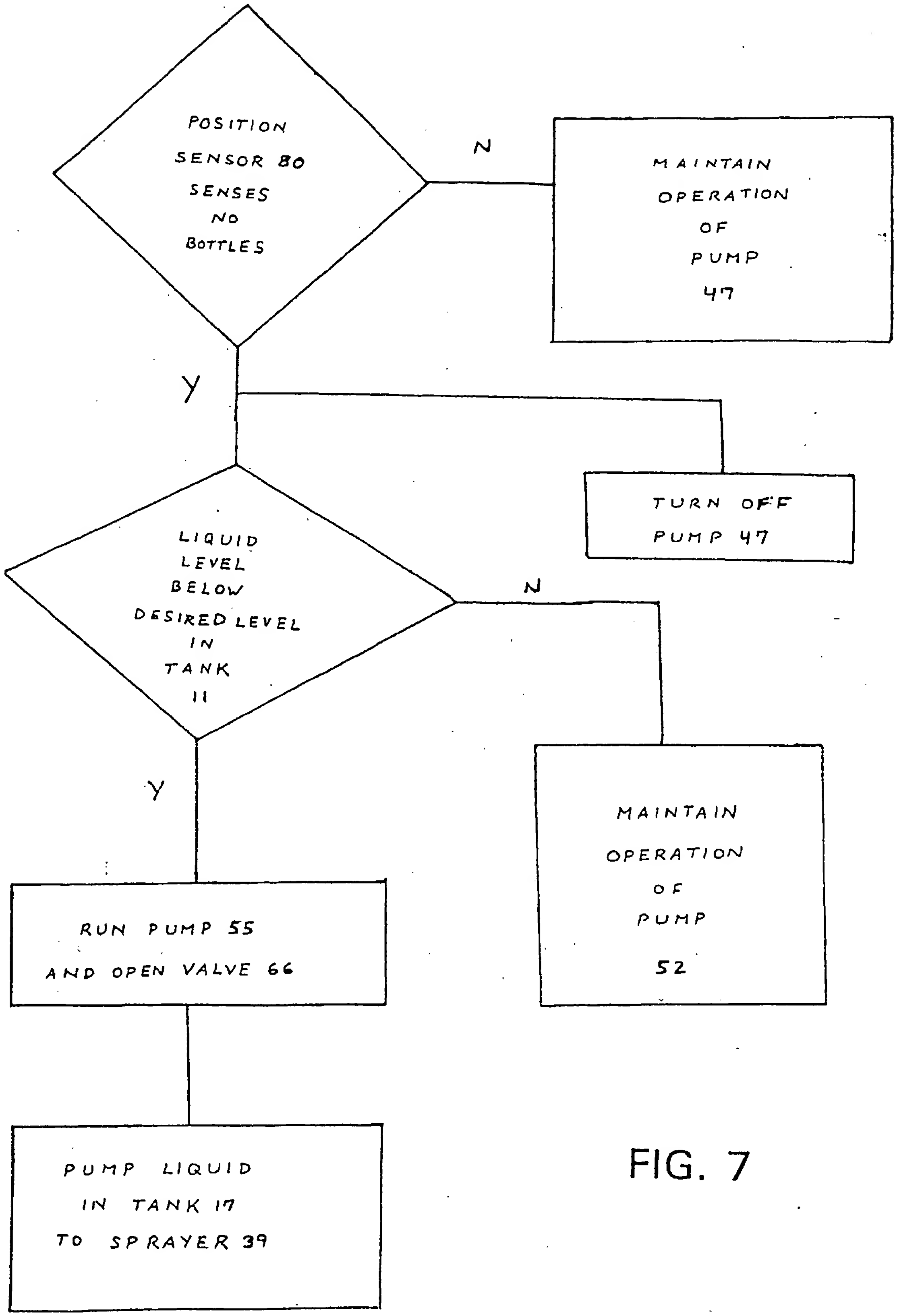


FIG. 7

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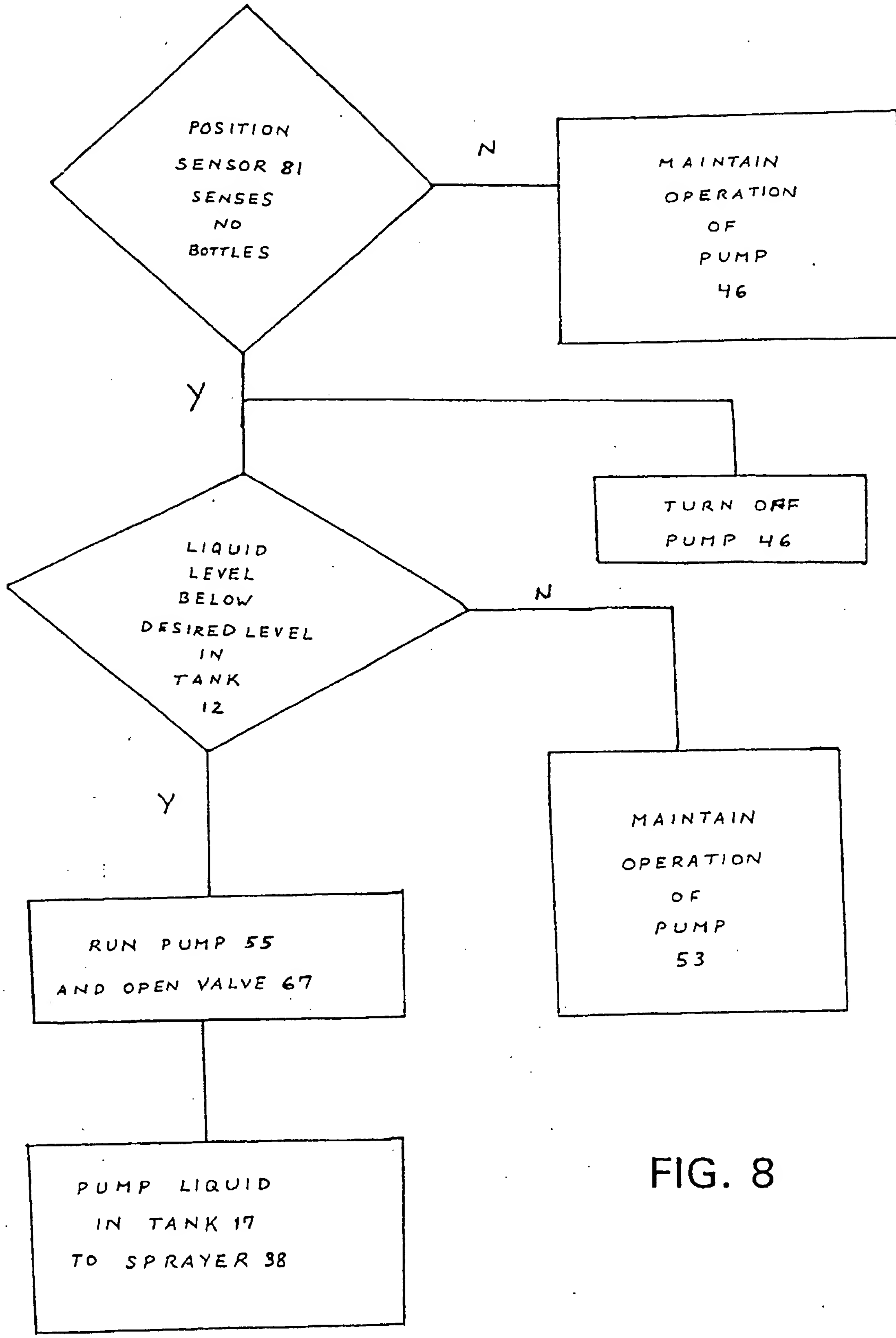


FIG. 8

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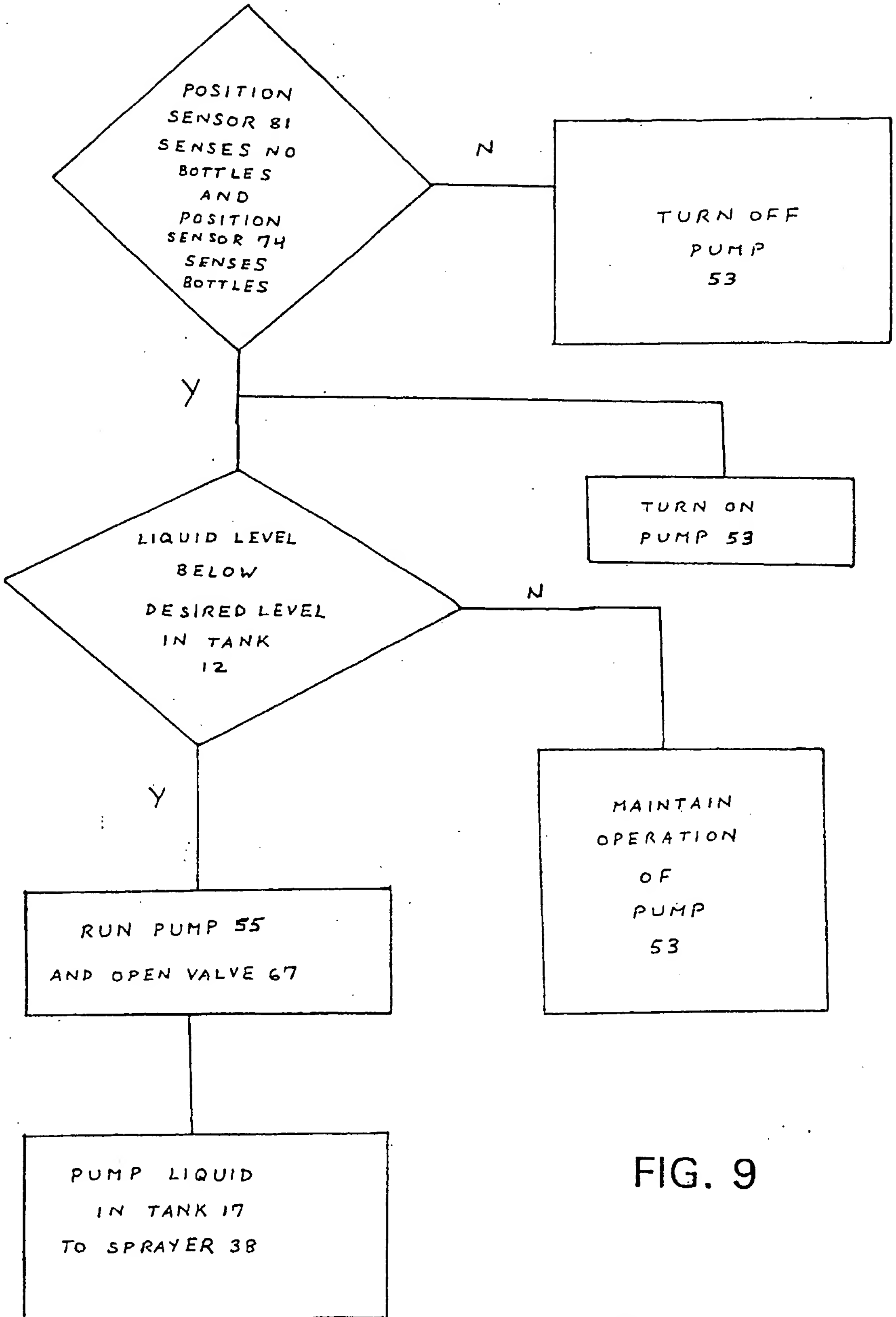


FIG. 9

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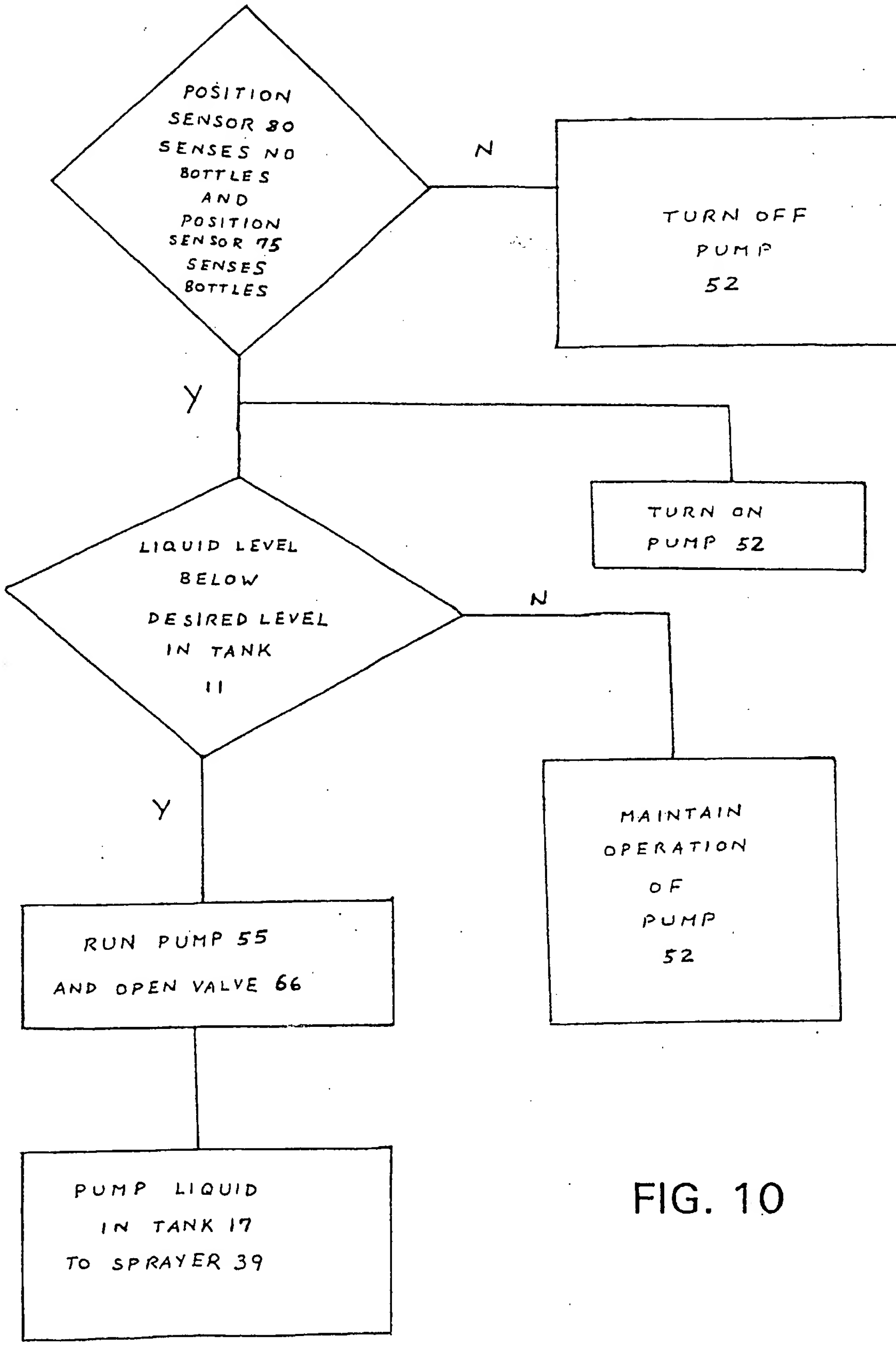


FIG. 10

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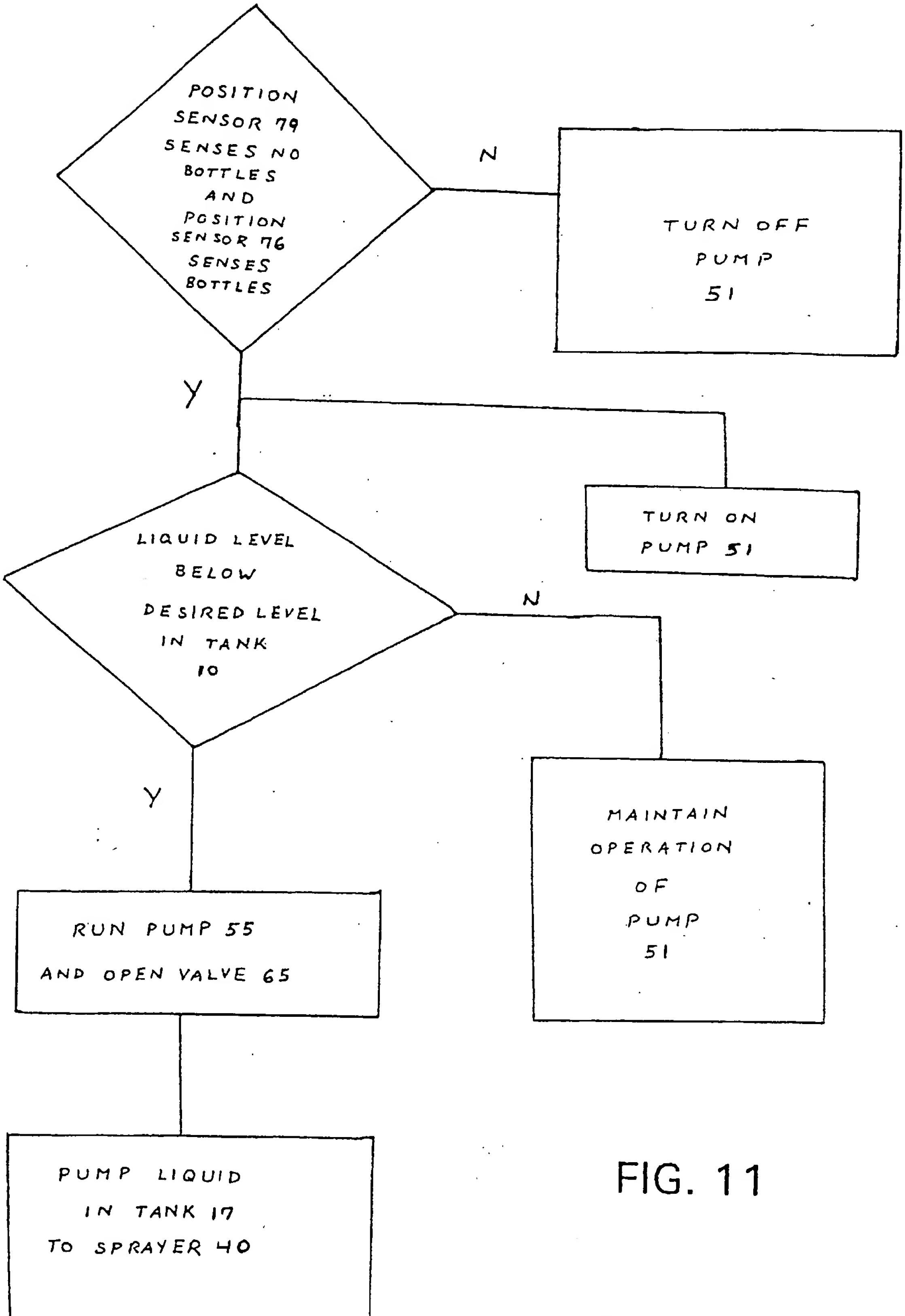


FIG. 11

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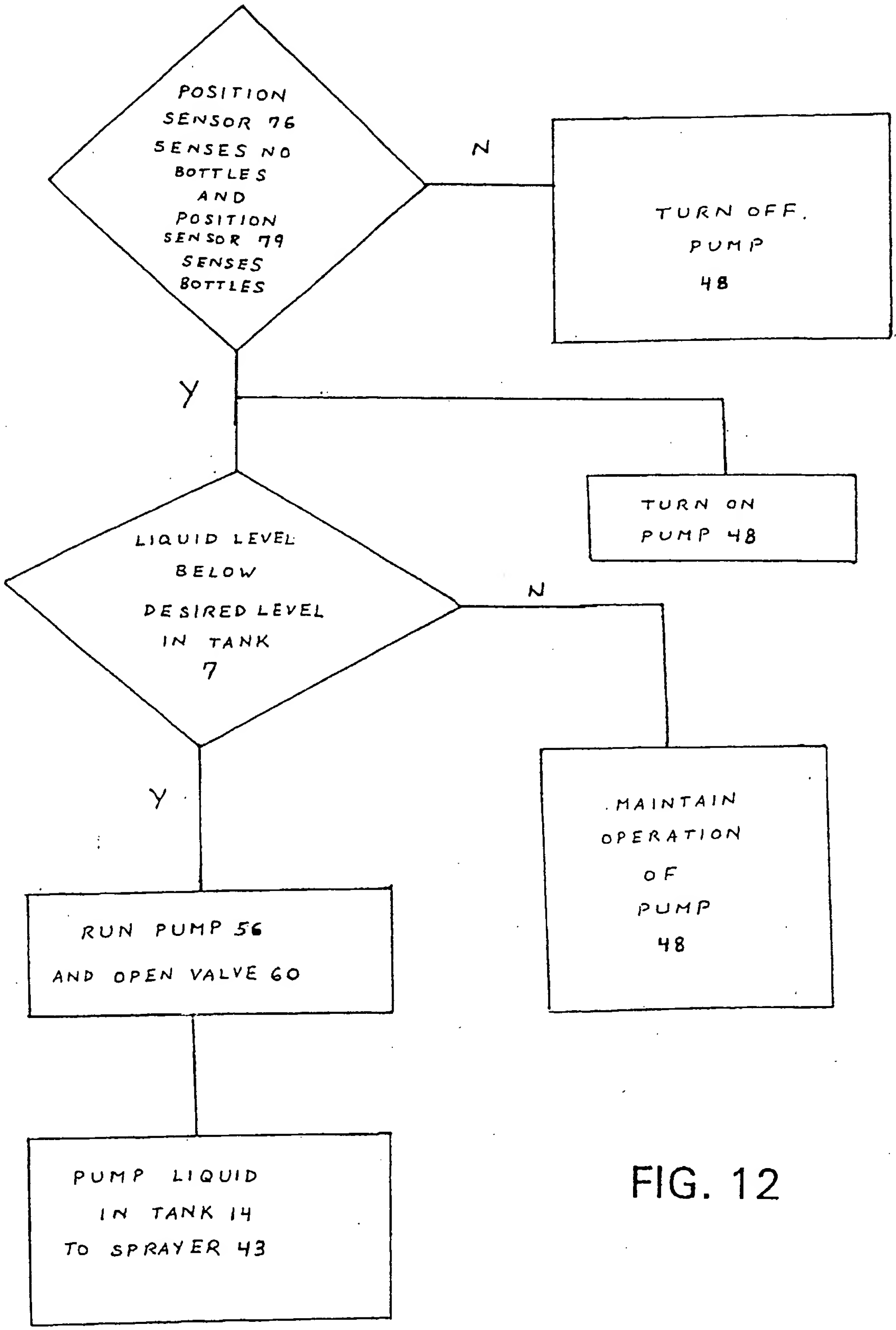


FIG. 12

Nils H. Ljungman
AGENT FOR APPLICANT(S)

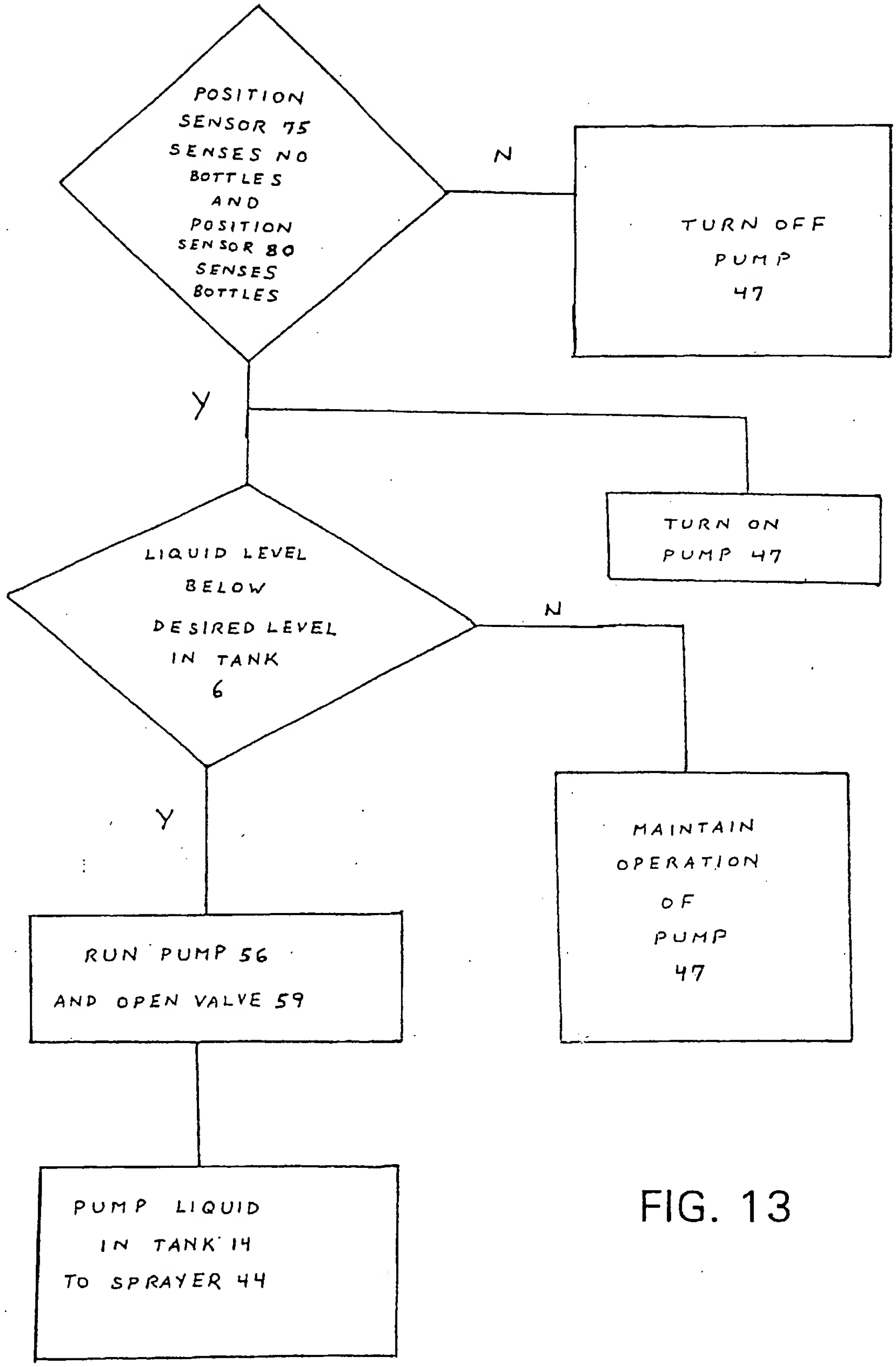


FIG. 13

AGENT FOR APPLICANT(S)

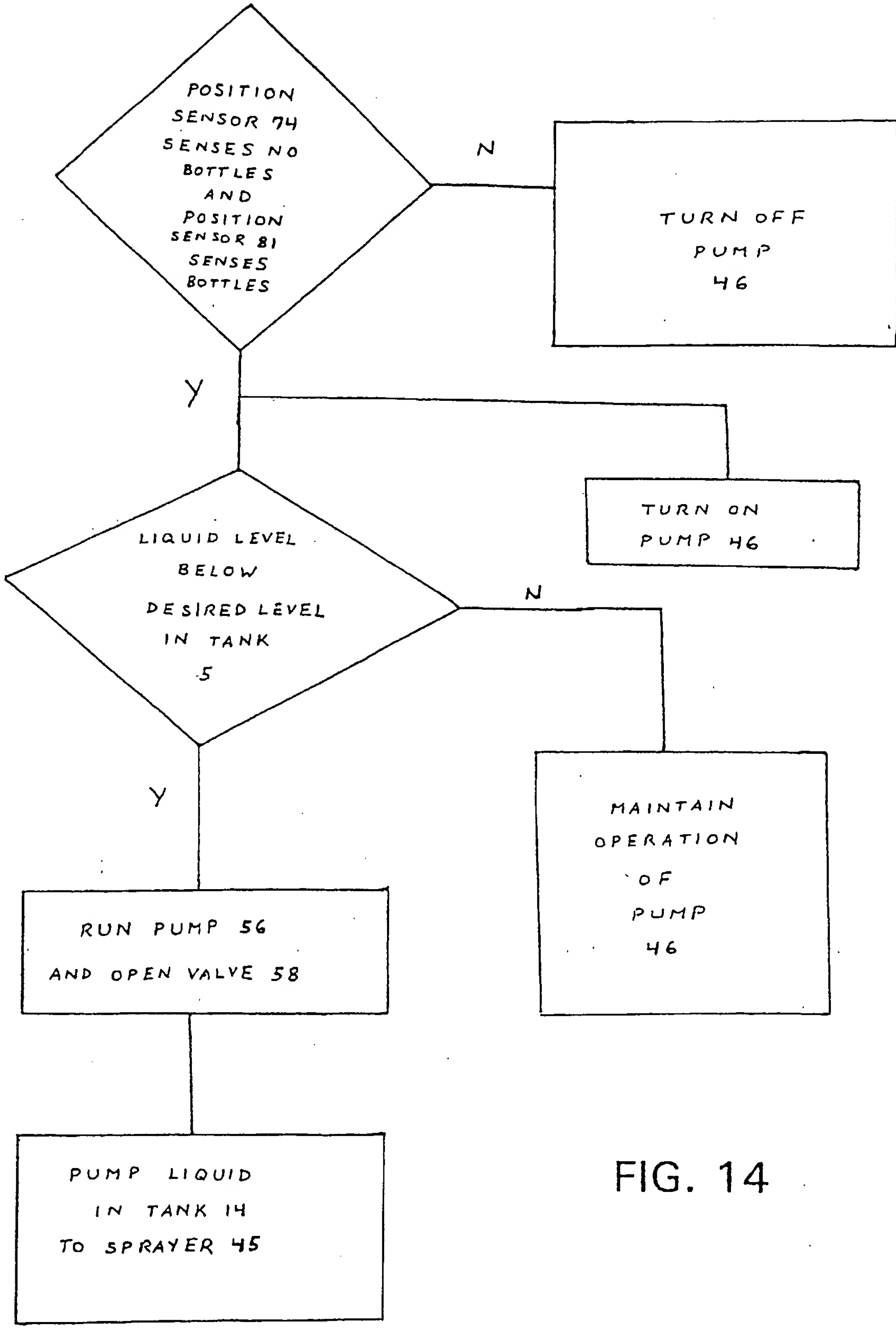


FIG. 14

AGENT FOR APPLICANT(S)

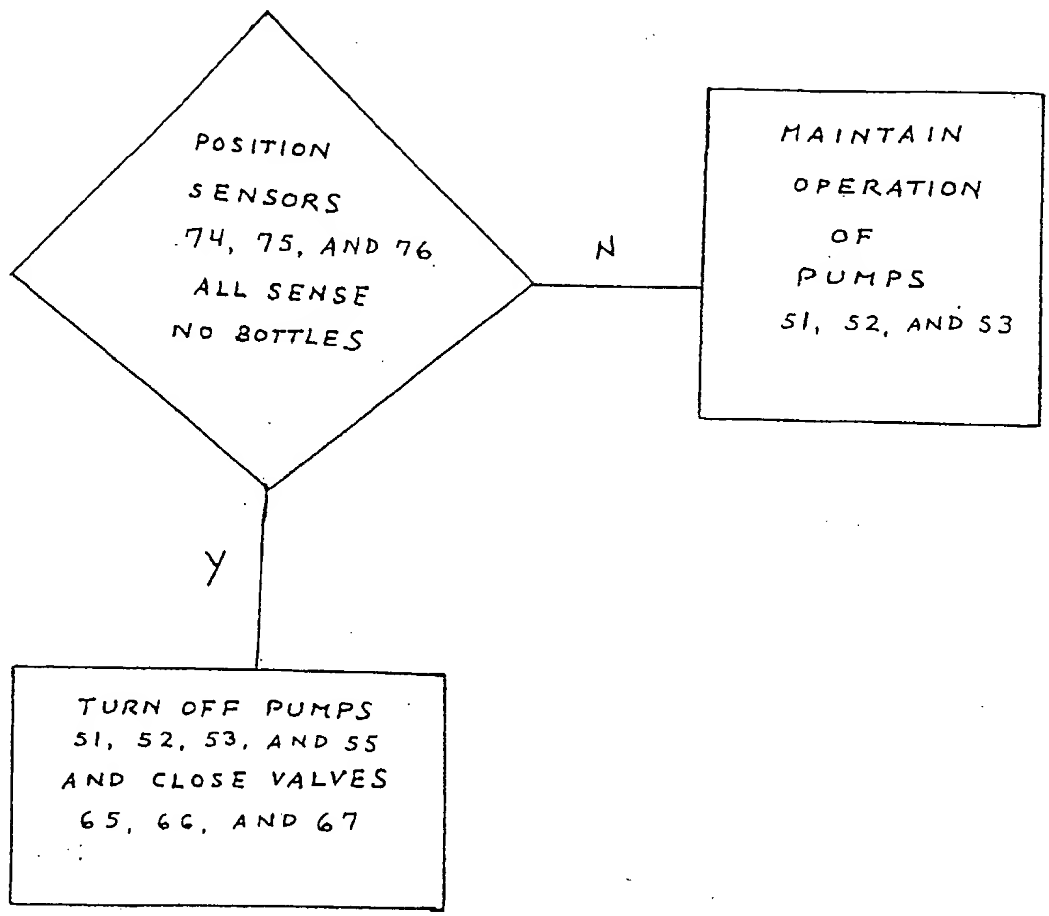


FIG. 15

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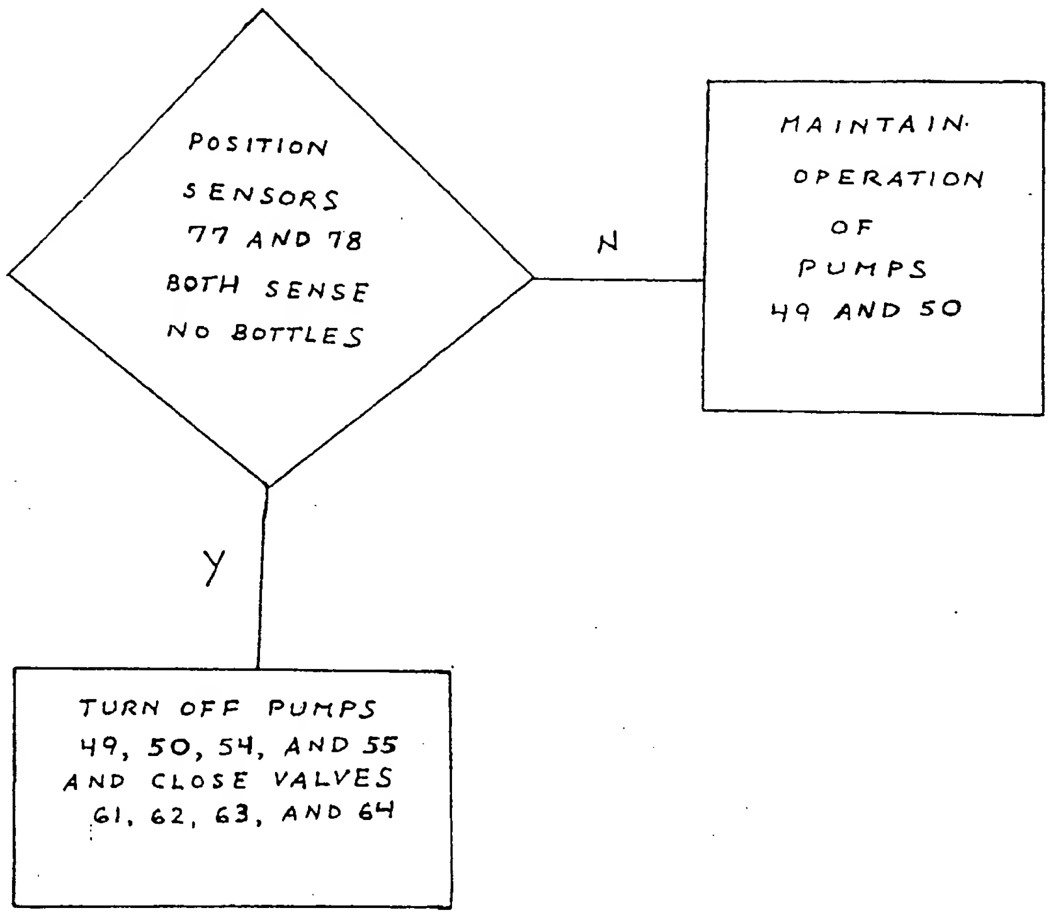


FIG. 16

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AGENT FOR APPLICANT(S)

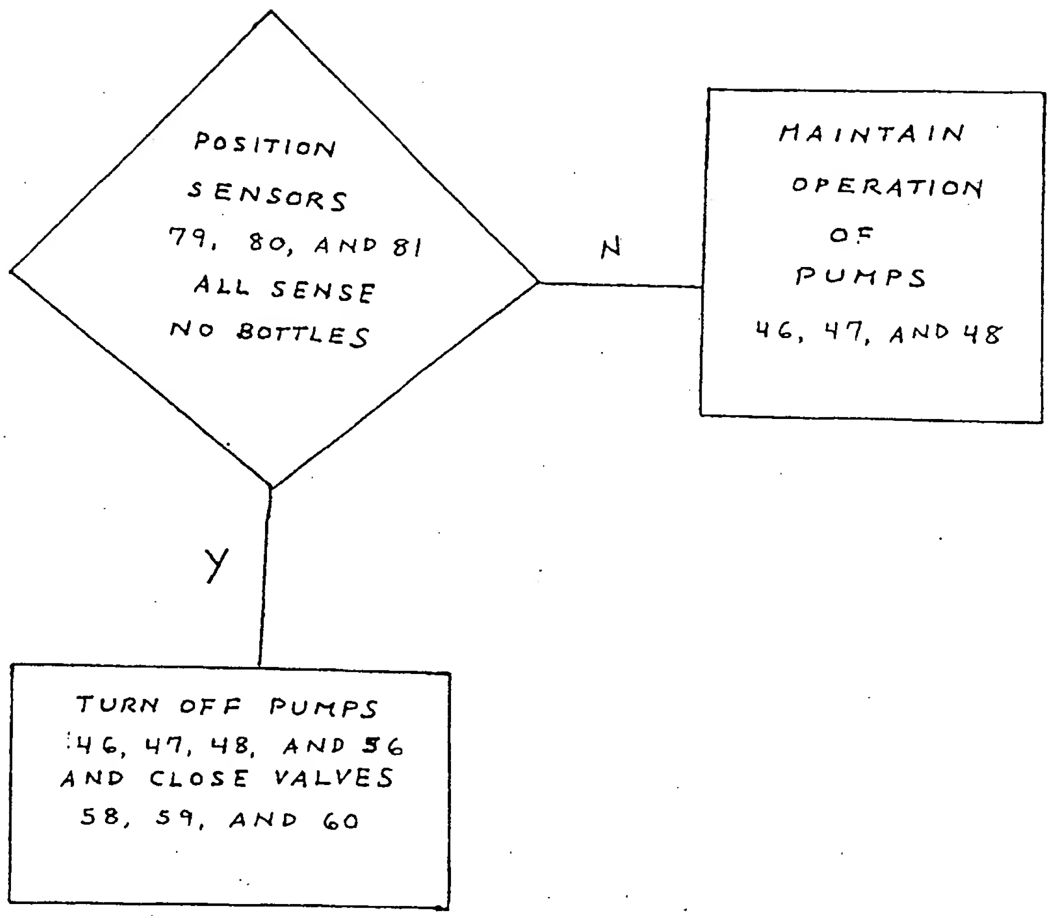



FIG. 17

AGENT FOR APPLICANT(S)

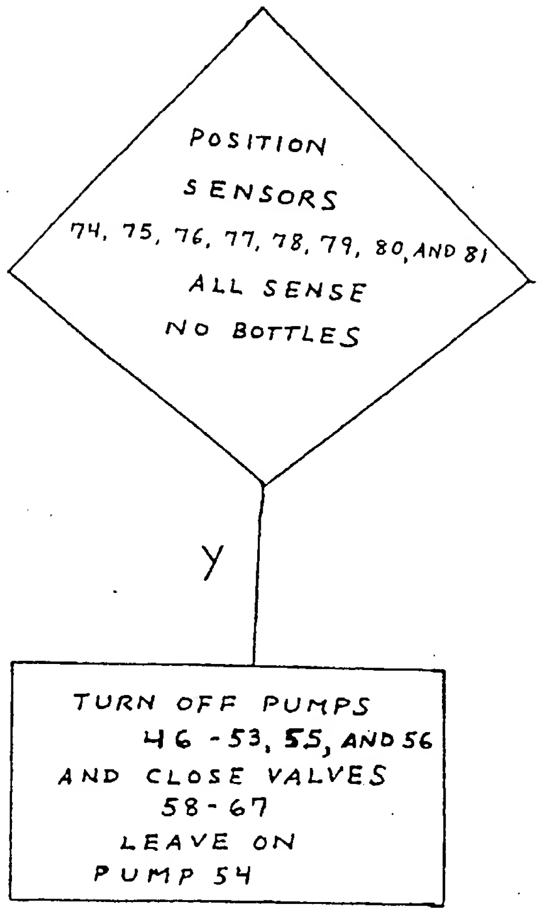



FIG. 18

AGENT FOR APPLICANT(S)

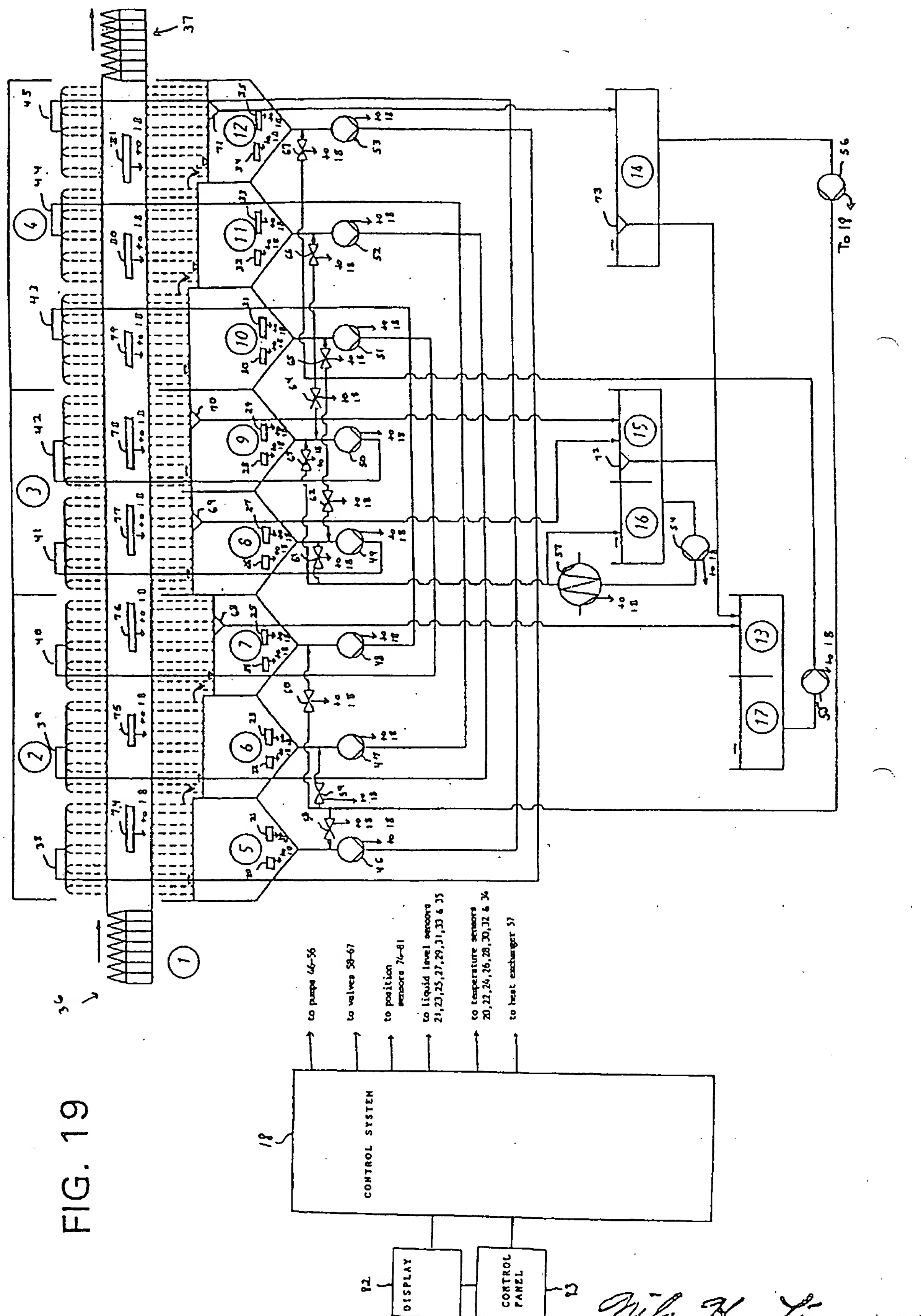
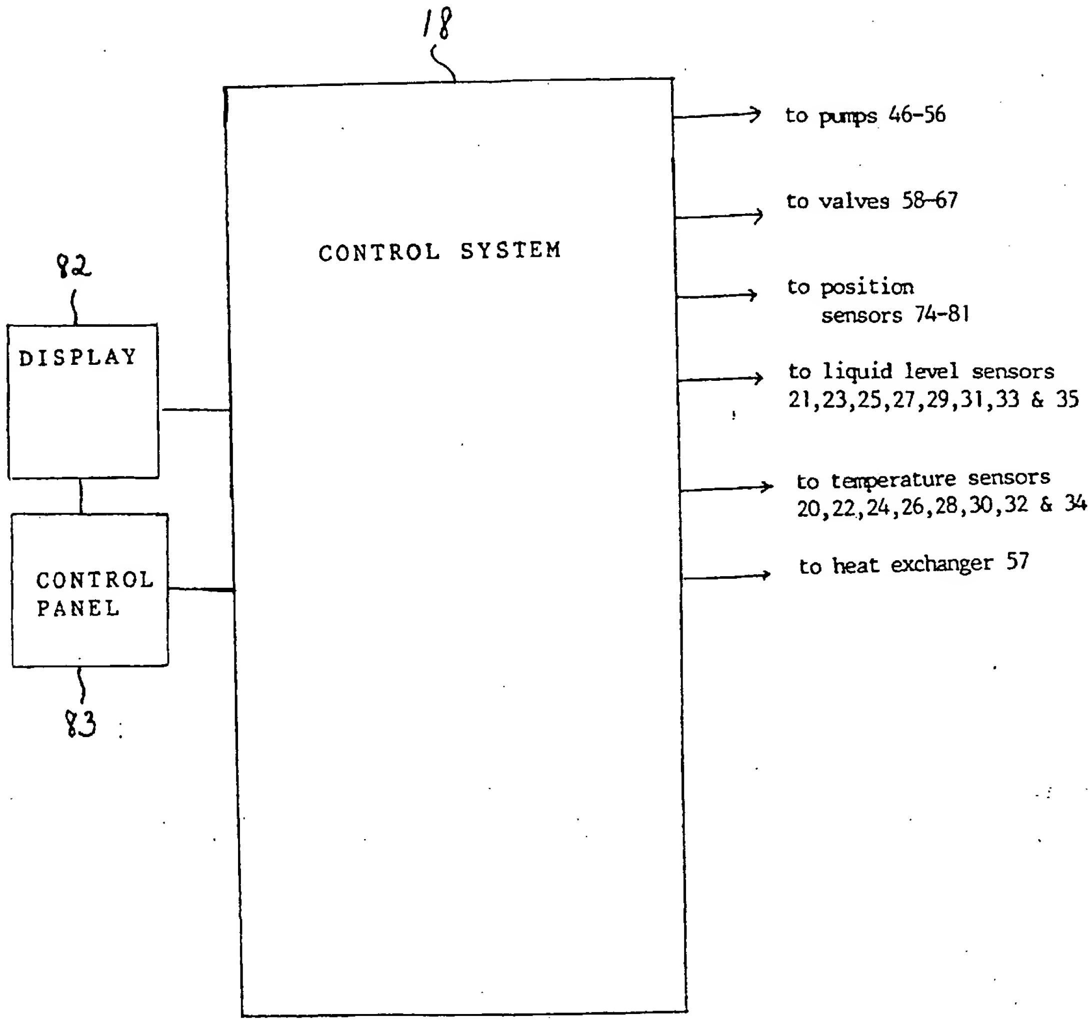



FIG. 19

Nils H. Ljungmar

AGENT FOR APPLICANT(S)

FIG. 19A




AGENT FOR APPLICANT(S)